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The Linotype, for whose production 729 items of machine tool equipment were replaced by new tools in one year

Tooling for Typesetters

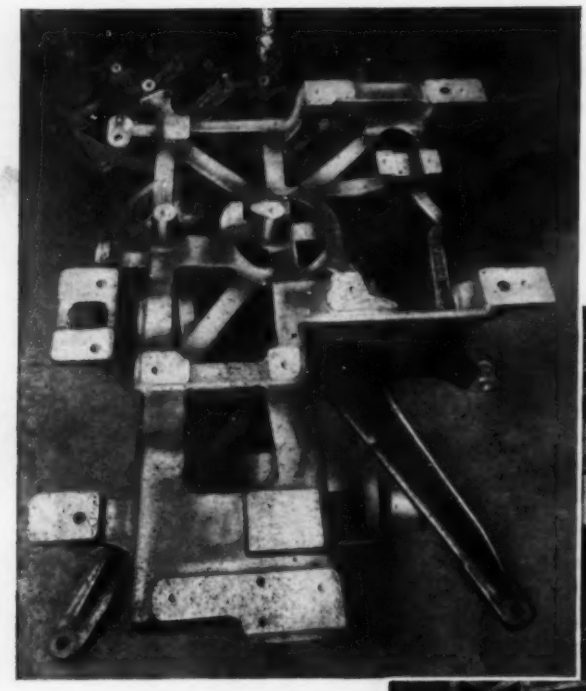
By R. R. Mead

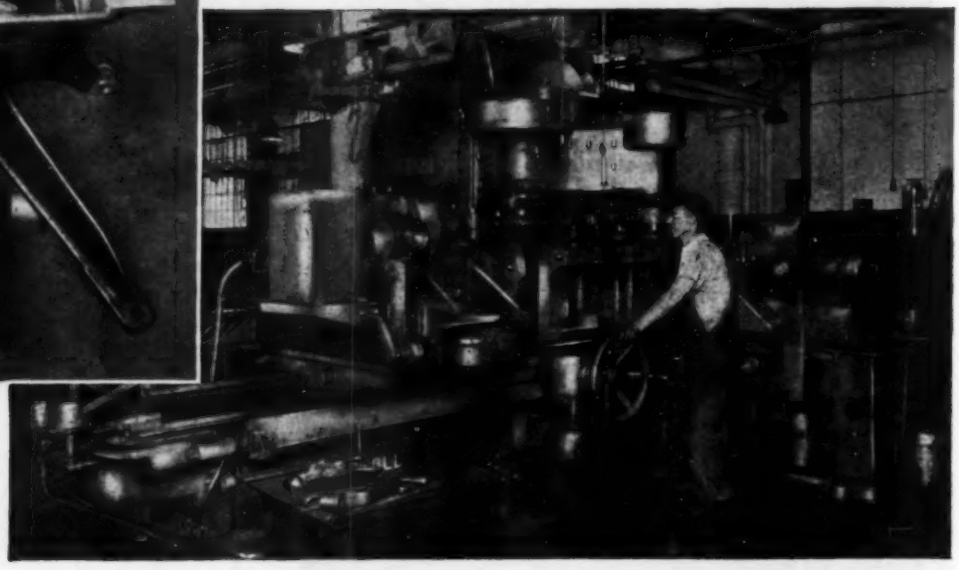
Assistant General Works Manager, Mergenthaler Linotype Company

CONTRARY to the usual trend of manufacturing was our demand for more accurate production rather than for more speedy production. We had come to the point where we required complete new facilities. After all, the printers' art is an individual art and the Mergenthaler Linotype Company must supply the need for machines to produce a multitude of type faces in a multiplicity of sizes. Linotypes are produced in six basic models all subject to innumerable minor and major changes to keep step with modern typography, our revamped plant being geared for an average of 300 complete machines per month. Certain fundamental parts must be interchangeable; therein lay our demand for accurate production.

That more accurate production through modern machine tools now gives us incidental dividends of more speedy and less expensive production is just another of those things that warm the hearts and brighten the eyes of operators, executors, directors, and shareholders. In retrospect our problem seems simple; in actuality it was complex.

Our basic problem included the rearrangement of our plant. This involved (1) the demolition of old buildings; (2) the substitution of new buildings to conform to uniform floor levels for economical handling, processing, and transfer of material and parts in process; (3) the provision of better and more sanitary working conditions for our employees; (4) the re-location of departments to best accommodate the desired improvement; (5) the rearrangement of our power equipment and power lines throughout, including the adoption of 220 v., 60 cycle, 3 phase current, with individual motor drives for each machine; (6) the replacement of some 729 items of machine tools equipment with up-to-date ma-





At the left is illustrated the Linotype "Base," the substructure upon whose accuracy and solidity depends the ready assembly and efficient functioning of the whole. Below—The 13-spindle, 5-head milling machine, especially designed to perform the milling operations on all machined surfaces of the base, except the feet

chines as well as the motorizing of 580 units still considered useful and economical for the work to be performed; (7) the provision of suitable steel equipment, tote boxes, bins, trucks, tramrails, etc., for the transportation and storage of raw materials and parts.

Our problem, moreover, was not alone to provide standard machine equipment, duplicating our old, but in many instances, to design special equipment and fixtures to include more than one operation in one machine. Thus we wished to conserve floor space, labor and time, as well as to secure more accurate and economical manufacture, later to be reflected in sub-assembling and erection economies. While all of the foregoing was under way, there could be no interference with the manufacturing schedule. Product was processed, assembled, erected, and shipped without holdup or delay. Some examples which resulted from our engineering layout and studies along this line follow.

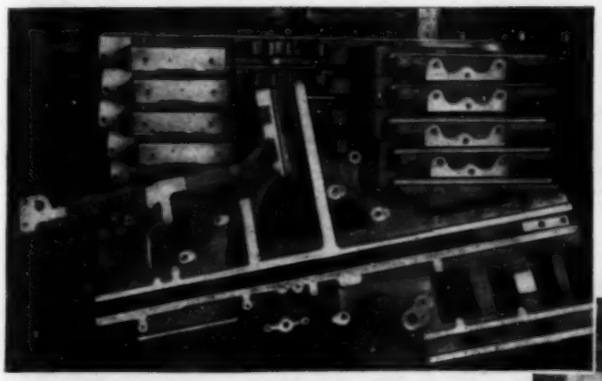
ESPECIALLY noteworthy is a special, 13-spindle, 5-head Ingersoll milling machine with individual motor spindle drive to each head and with Oilgear drive for table and head slides This machine performs the milling operations complete on all machined surfaces of the Linotype base, except the feet, in one forward and return cycle of the table, and takes the place of two 42" x 24" x 16' four head, six spindle, adjustable rail milling machines, two large boring mills, and one large vertical milling machine. These five machines would have involved an expenditure of $39,000 and would have occupied five men and two helpers operating 663¼ hours per month. With an investment outlay of $35,850 for this special machine, and with one operator and one helper, we produce the same number of parts in 125 machine hours, or a machine hour saving of 538¼ hours.

On a group of ten various types of milling machines, located in one of the departments, we were confronted with a problem not only of replacing obsolete equipment with new, but with the necessity of having to provide additional machine equipment of a like character in order to conform to new plant layout This would have involved an expenditure in the neighborhood of $15,000 without any appreciable saving in parts production cost except as to economical handling in conjunction with the general scheme.

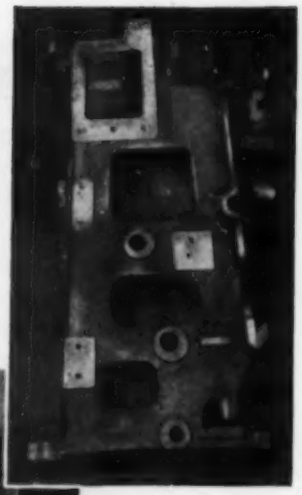
After an analysis of the condition, we found that by introducing the 42" x 24" x 16', four head, adjustable rail, Ingersoll milling machine, shown opposite, for the various milling operations of Linotype column and face plate, which were handled in multiples of eight and six respectively, and finishing the surface milling with one cycle of the table forward and back, we are able to secure a substantial reduction on labor with a consequential increase in production and with a capacity for schedule increase wherever necessary. Machine hours required for operations covering the schedule on the old group were 246.8, on the new equipment 120.3—difference 126.5. This gain is offset, to a certain extent, by a difference in the set up time, which in the instance of the old equipment, is 6 hours, as against 26 hours for the new.

The machining of one side and base of the Linotype column, which operations are not a part of the foregoing, were handled on two 36" x 36" x 10' planers, producing 300 parts per month production .9 piece per hour or 333 hours per month, with two machines, two operators, one helper. Replacing obsolete equipment of a similar type would have involved an expenditure of $19,000.

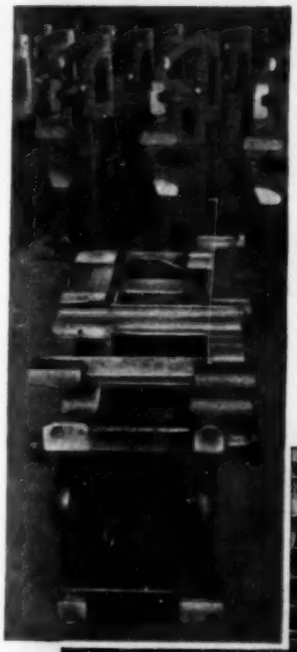
An analysis indicated that by introducing the 42" x 20" x 14' six rail milling machine shown, with two vertical and one horizontal heads in front and one vertical head in the rear, with capacity to machine 8



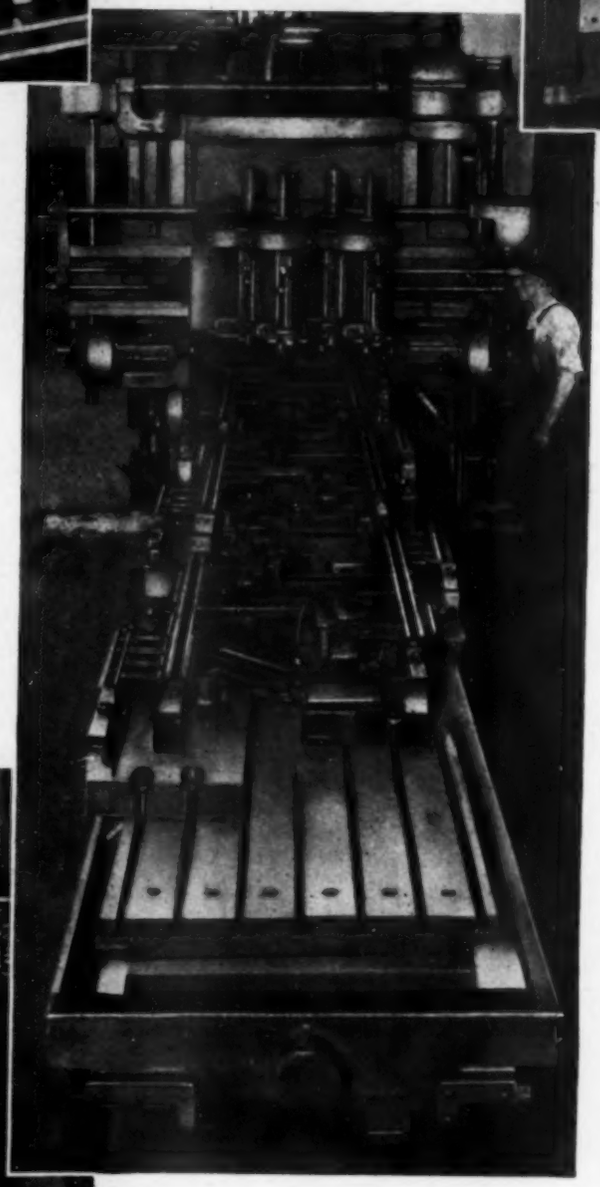
At the right—A four head, adjustable rail, 42"x24"x16', milling machine, equipped to surface mill both columns and faceplates in multiples of eight and six respectively. They are finished in one cycle of the table forward and back

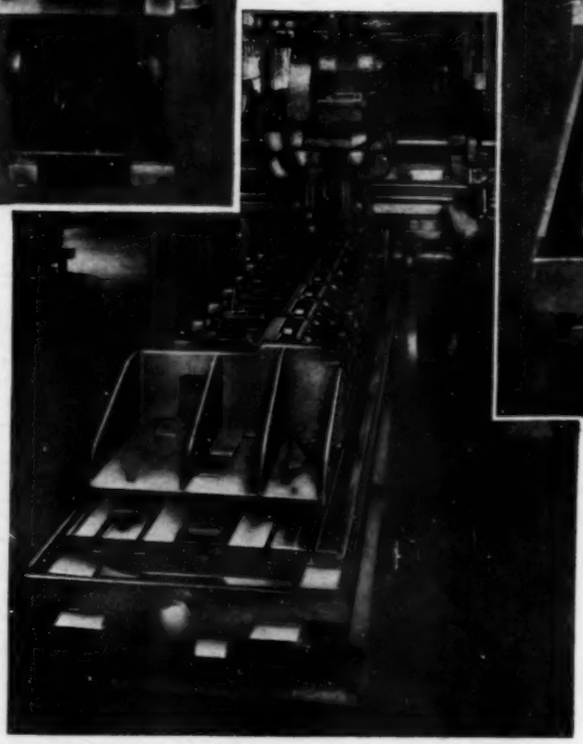


At the right—The many surfaces of the "Column" must also be milled to high degrees of accuracy. At the left — The "Faceplate" which extends, unseen, across the front of the Linotype, about on a level with the eyes of the operator



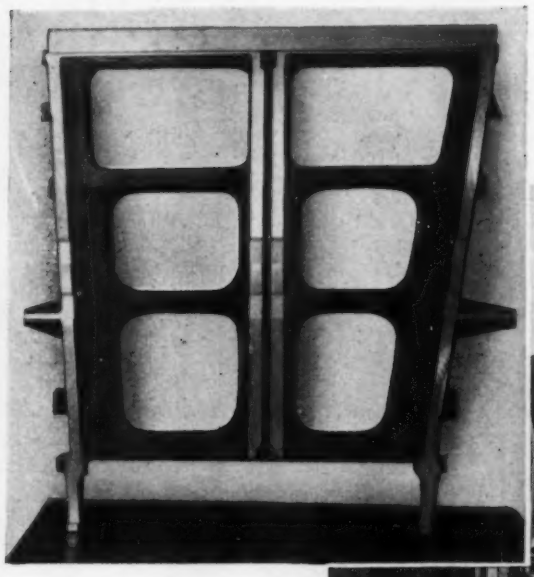
At the left — Another view of the column. Below — One side and the base of the column are milled on a special six rail, four head, 42"x20"x14' machine





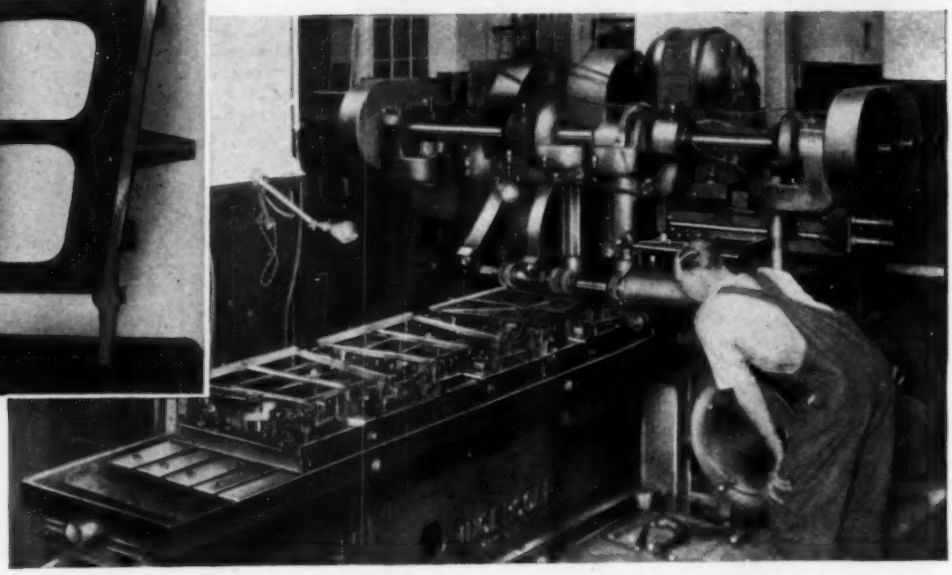
pieces per load in one forward and return cycle of table, we could produce 2.16 pieces per hour or 300 pieces in 138.8 hours with one operator and one helper, with an expenditure of $11,410. The conclusion, of course, was to install the milling machine.

The machining of the top surfaces of the Linotype magazine frames was formerly handled by six 24" x 24" x 6' planers, producing 900 parts per month, production .9 piece or 1,000 hours per month, six machines, six operators, one helper. Replacing obsolete equipment of



Above—The "Magazine Frame" which supports the magazines containing the type matrices. It must be most accurately machined to take interchangeable magazines containing various fonts

Below—A special fixed rail milling machine, with horizontal arbor for shape milling and two vertical heads for face milling, arranged to machine three frames per load with one forward and return cycle of the table

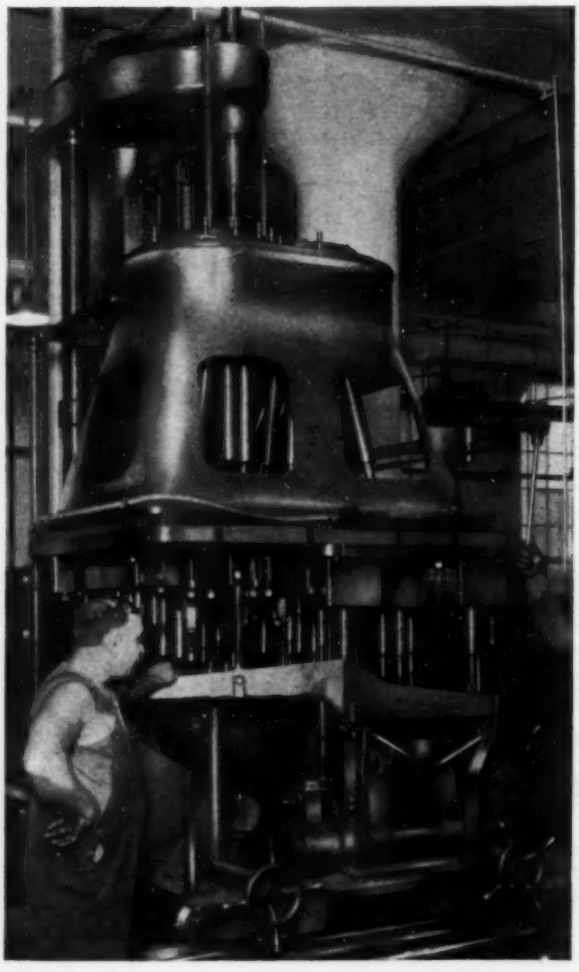


similar type would have meant an expenditure of $33,000. Analysis indicated that by introducing a special fixed rail milling machine, with horizontal arbor for shape milling and two vertical heads for face mills, arranged to machine 3 pieces per load with one forward and return cycle of table, we could produce 6 pieces per hour or 900 pieces in 150 hours, with one operator and one helper, involving an expenditure of $9,000. It is obvious that the milling machine had to be selected for this work.

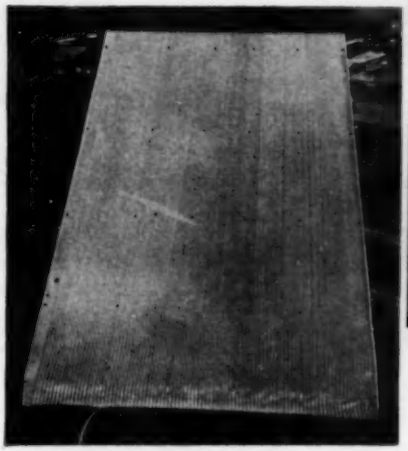
In another day, the operations of drilling, reaming, facing, tapping, and counterboring the bulkier Linotype castings, such as base, column, distributor bracket, and face plates, were performed on a group of 19 machines, consisting of 5′ radial drills, 24″ 1 spindle drilling machines, 4 and 6 spindle sensitive drilling machines, and tapping machines. The available machine hours per month were 3,496, of which 1927 hours were consumed by the above parts, while the balance of 1569 hours were consumed by 261 operations on some 137 other parts. The equipment was aged from 7 to 32 years. It is obvious that much of this equipment would have to be replaced with new and that, owing to work having to be routed to conform to progressive operation manufacture, there would be no longer the possibility of grouping the equipment in any one department or locality.

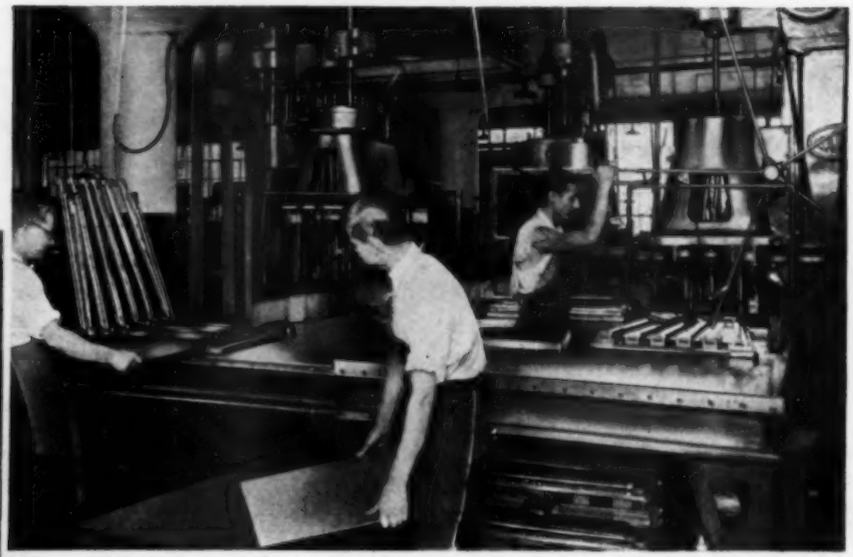
WE found by the introduction of equipment that would perform the operations on these larger parts, in multiple, that we could localize the operations and quite considerably reduce the labor involved. With an installation of two vertical multiple spindle drilling machines and three horizontal multiple drills for cross and end drilling, with one 5′ radial drill in line for bases and columns, and four vertical multiple drilling machines, with two 3′ radial drills in line for distributor brackets and face plates, we were able to take the 1927 hours for the production of the above parts from the older type of equipment and process the work under the new ar-

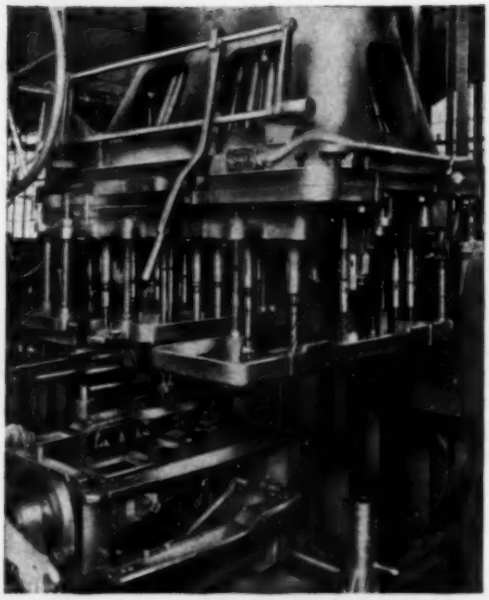
Below—A vertical multiple spindle drilling machine especially designed to drill, ream, face, tap, and bore the bulkier Linotype castings, such as the base, the column, the distributor bracket, and the face plate



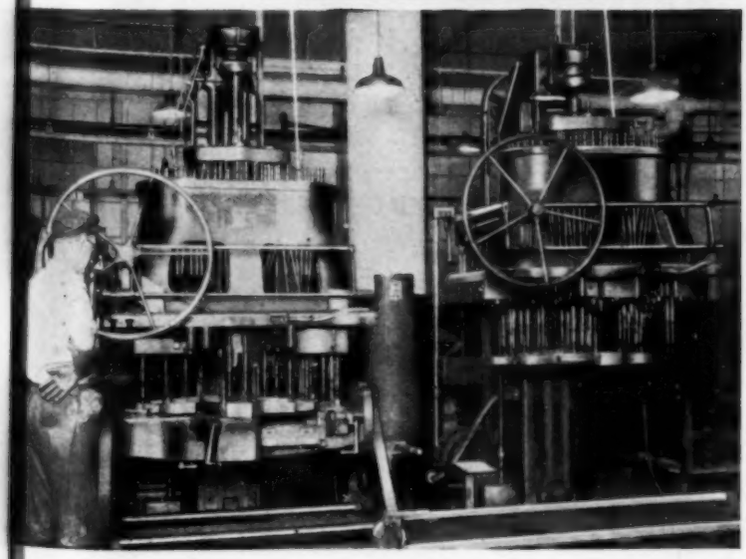
Below—The "Magazine Plates" whose grooves guide and hold the type matrices in the magazine. At the right—A special grouping of three multiple spindle drilling machines to handle the plates with one operator and two helpers







At the right — A close-up of a special rolling jig to hold the column under the multiple spindle drilling machine. Below — Note the rails which permit work to be transferred from one drilling station to the next



rangement in 761 machine hours, a machine hour reduction of 1,166 hours per month, with a consequential reduction in labor hours of 852 per month. This layout included suitable trunnion carriages and fixtures, and special tool equipment with all multiple drilling machines. Feeds are under either electric or hydraulic control and operation. Our total investment outlay for the entire group, except the radial drills in line, was approximately $70,000.

The Linotype magazine plates of which two are used per magazine, one top and bottom, are produced in quantities to meet machine schedules and supplies. The drilling of these plates had always been performed on a special single spindle sensitive drilling machine, which involved for a certain quantity over a year's period 3,000 machine and labor hours. By the introduction of the three multiple spindle drilling machines illustrated herewith, arranged in a triangle, with a jig loading and unloading station, and with one drill operator and two helpers for loading and unloading, we were enabled to reduce the machine hours for the same number of pieces to 423 hours, or 2,577 machine hours reduction per year, at the same time reducing the labor hours to 1,269—a direct labor saving of 1,731 hours per year. Our investment outlay for this equipment was $10,615.

The real surprise arising out of our revamping and retooling is that, in many instances, the cost of new tools combining operations was lower than that of replacing old tools item for item. The cost of continuing obsolete equipment in operation would thus have been prohibitive, and we could not now be realizing on our savings of man-hours and machine-hours plus our gains in accurate and speedy production.

BELT guards should be sturdily constructed, but not be too bulky. Their strength constitutes a safety factor for the workmen, and bulkiness has to do with space requirements around the machines for storage or passages. A guard should not obstruct the operator's vision nor prevent the passage of light required upon the work. For maintenance purposes, the design of the guard should be such that it will permit ready accessibility to the belt, pulleys, or gears in the cage. In the manufacture of machinery, belt guards should be incorporated with other pieces in a single casting.

Weatherproofing Winterfronts

By Frank J. Oliver, Jr.
Western Editor, American Machinist

MATERIAL-HANDLING equipment plays an important part in a modern finishing installation, such as the enameling apparatus now in operation at the new plant of the Pines Winterfront Company in Chicago. Other factors indicative of good practice are automatic temperature and cycle control of the baking ovens, and cleanliness. In this particular layout, the material-handling equipment is divided into two parts. The first consists of an overhead monorail system which carries the pressed steel parts successively through the washer, dryer, and spray booths; the second, of rack-type trucks upon which the parts are brought to the ovens and propelled mechanically through them.

The washer consists of a long tunnel separated roughly into three parts in which cleaning, rinsing, and drying take place successively. Parts pass through the washer suspended from one of two independent overhead monorails and are first sprayed by a hot washing compound delivered under a pressure of 35 lb. per sq.in. and then by clear hot water. In order to cut down heat losses and to save compound, the liquid is kept in continuous circulation by a motor-driven centrifugal pump in conjunction with a reservoir. A similar arrangement is used for the rinse water. Enough fresh compound is added to keep an overflow of the grease scum, formed on top of the reservoir, into a drain tank at the side. Live steam, the volume of which is thermostatically controlled, supplies the heat.

Open gas flames are used in the dryer section, and any surplus globules of water are wiped off, outside the tunnel, with a rag dampened in alcohol, before the parts reach the spray booths. These booths are divided into two parts with an operator in each compartment, one spraying one side, another the other. A black, rubber-base enamel is applied for the first coat. After baking, a varnish coat is added.

BY means of a variable-speed drive, the conveyor can be operated at speeds from 10 to 20 ft. per min., depending upon the class of work going through. Obviously, the limiting operation is the spray enameling, since the number of Winterfront frames (or of racks containing shutters) placed on the line can readily be set by the number of operators loading the line. Special racks are employed to hold the shutters in a vertical position while they are on the line, and benches are provided near the washer for loading them. Frames are simply suspended directly from the conveyor chain hooks.

When the parts leave the spray booths, they are removed from the conveyor hooks and placed on wheeled trucks having about eighteen shelves. These trucks are brought to the two baking tunnels, one of which is for the base coat, the other for the varnish finish. A temperature of 375-400 deg. F. is maintained in the ovens, which are about 65 ft. long, exclusive of the vestibules at each end; the average baking period is about one hour. The work is heated by hot air kept in continuous circulation by a blower on the top of the compartment

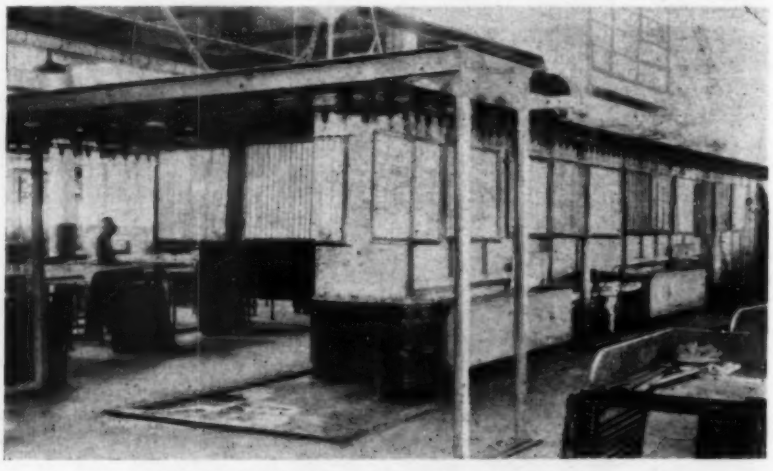


Fig. 1—Winterfront shutter pieces, loaded on carrier frames, about to enter the washer

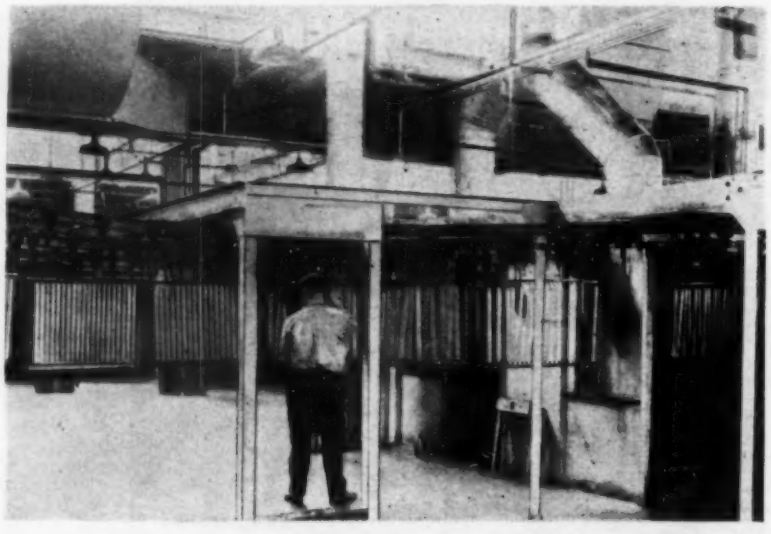


Fig. 2—Before entering the spray booth on the right, the shutters are wiped to remove any globules of moisture

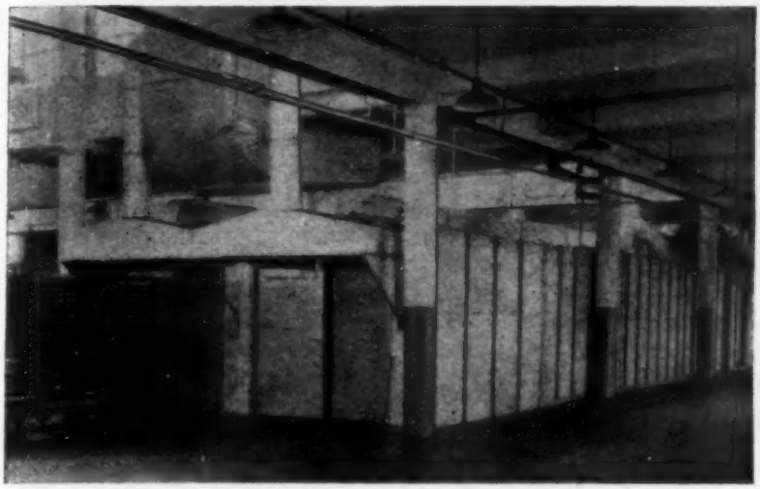


Fig. 3—A truck load of material ready to be pushed into the vestibule of the baking oven

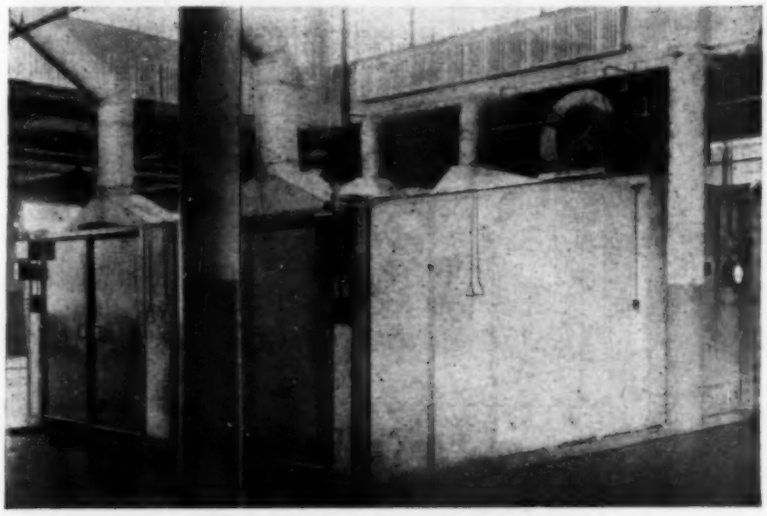


Fig. 4—Discharge end of the ovens showing the heater and circulating fan on the roof of the compartment

near the discharge end, Fig. 4. The air is drawn through a gas "engine" or burner chamber where, incidentally, all volatile matter is completely burned, thus economizing on city gas. Through a thermostatic control, the desired temperature can be set and maintained. Once shut off by the thermostat, when the temperature drops to 400 deg., the gas is turned on and again ignited by a constantly flashing spark plug, over which a red signal light stands guard.

In Fig. 3 is shown the entrance end of the tunnels. The first 12 ft. constitute a vestibule where the carrier truck awaits entrance into the oven proper. At intervals of about 6 min., depending upon the desired cycle, the inner doors swing open and a latch on a power chain in the floor propels the truck into the oven, carrying it a distance of about 14 ft. The chain then reverses, and is ready to pick up the following truck. Once in the oven, the cycle movement of each truck is only 8 ft. because of the fact that inside the oven each latch on the chain moves 6 ft. before contacting with the drive bars of the trucks. In this way the larger movement necessary to get the trucks through the swinging doors at the entrance and exit is obtained without interfering with the normal cycle travel within the oven. There are eight trucks in each oven simultaneously. The cycle time may be varied over a wide range by adjusting the motor controls.

AT the discharge end there is also a vestibule, ventilated naturally by air pipes leading to the roof. In it the fumes are allowed to escape and the work to cool off. Signal lights at this end indicate whether the chain drive is standing still or, if operating, in what direction it is traveling.

All the spraying and baking apparatus is housed in a partitioned-off part of the building in which slightly more than atmospheric pressure is developed through the heating and ventilating air system. With this arrangement, when a door leading to this section is opened, air is discharged into the outside room so that no dust in that room can be carried into the finishing department. This department is kept very clean and free from litter, and as an added precaution, the oiled hardwood floors are gone over daily with a vacuum cleaner to assure a high quality finish on the product. Furthermore, the air supplied in the heater system is filtered before being passed over the steam coils from where it is led to the finishing room by sheet-metal ducts of large capacity.

The results of this attention to detail are shown clearly in the finished product. The front of the car usually strikes the eye of the beholder first, and the finish on the winterfronts must compare favorably with the finish on the fenders. Final appearance depends just as much on the smoothness of the surface to be enameled as it does upon the enamel used.

A Safety Sign for Ladders

By Theodore Kruger
Tool Foreman, The Diamond Machine Company

The illustration shows a safety sign used on step ladders. It is made of thin galvanized sheet metal and has white letters on a green background. It is suspended from the center of the ladder far enough back so that it will not touch the toe of the shoe of anyone using the ladder, yet it presents its message to the workman going down or coming up.

Workmen frequently leave tools and parts on the top step. When the ladder is moved these fall off, and may possibly cause injury.

SAFETY FIRST
REMOVE ALL LOOSE TOOLS
AND MATERIAL FROM LADDER
BEFORE MOVING IT

EXECUTIVE · FORUM

Does Reciprocity Pay?

FRANK WALLACE, sales manager of the Viking Tool Company, felt glad to be back in his home town as he alighted from the train. Three strenuous weeks spent in contacting important prospects had yielded both success and disappointment.

"Well, Wallace, I suppose you've returned with a bag full of orders?" a good natured voice greeted him. Turning, he saw Donald M. Graham, Viking's president.

"Hello, Mr. Graham. I didn't expect to see you so soon—I planned to report at the plant this afternoon."

"I just happened to be seeing my boy off to camp," Graham explained. "But since I ran across you, why not join me for lunch where we can talk things over without interruption?"

After being seated, Graham observed, "According to the trade reports, buying is more active than it has been in months. I hope you succeeded in getting your share of orders."

Wallace seemed to lack his customary enthusiasm. "Yes, in general business is better, and I did not come back empty-handed. But yesterday at the Cummings Electric Company I received something of a jolt."

"That's odd," replied Graham in surprise. "We have always counted the Cummings Company among our best friends. They have used Viking equipment for over twenty years. As you know, their shop has been a favorite place to take stubborn prospects. Our name plate bobs up everywhere you turn."

"We both know the reason for that," said Wallace. "Although no written agreement exists—nor oral one for that matter—we have consistently furnished Cummings motors with our machines unless the customer specified otherwise. In return, Cummings has purchased our products whenever fitted to their needs."

"Naturally we favor our customers," Graham agreed. "That's good business. But why their sudden change of heart?"

"I knew they were in the market for three machines, and I went there thinking the order was in the bag," Wallace explained. "The business has not been placed yet, but it was made clear to me that we are now on the same footing as other tool manufacturers. They frankly admit that many of the past dealings between the two firms were based on reciprocity. Now they take the stand that this policy is neither sound nor profitable."

"Perhaps, I should see their president," suggested Graham. "He is an old friend of mine."

"I wouldn't advise it in their present humor," Wallace cautioned. "I believe they are set on placing orders on a purely competitive basis. A personal appeal might rub them the wrong way. Besides, I am not sure but that they are right."

"In what way?" inquired Graham.

"In their contention that reciprocal buying is obsolete," Wallace stated. "Aside from the principle involved, they found that by favoring us, they lost business with other tool manufacturers. I wonder if the same reasoning doesn't apply to us as well."

Topic suggested by H. S. Deeley, Canadian Johns Manville Company.

What Do You Think About This Executive Problem?

Reciprocity in buying has long been practiced everywhere. It is a natural inclination to favor a concern which regularly buys from you. However, in many instances this practice is now being avoided. In some, one division of a given corporation is made to compete against outside bidders for the orders of another division.

Is reciprocity good business? Does it secure desirable and permanent connections? Do its disadvantages overshadow its advantages? *American Machinist* invites your views on the subject.

DISCUSSION

OF PREVIOUS PROBLEMS

Should Price or Payroll Be Cut?

If price is not cut, important business may be lost to the firm, new or important connections may be diverted to others, and future broadening of the enterprise may be restricted. These are all important and vital factors to any enterprise. There are times when customers can demand price concessions on nearly all standard products, and if at such times profits are reduced and a customer is made or retained, it would seem policy to do it.

I would suggest that a meeting be held with the important employees of the organization, and all cards be laid on the table. In this meeting it would not be necessary to invoke the voice of others than the loyal capable men who have helped build the business. It would seem to be right and proper that they should say whether they were willing to undergo a modification in their wage for a specific time, if by so doing, it will hold them all in the corporate family for the better days that are ahead.

While the cut in wages should be the last thing considered or suggested, if the modification in price of product would retain the old customer or secure the new one, a fair appeal to even the most conservative of employees would no doubt meet with favorable action in wage reduction and develop a feeling of co-operative fellowship.

—HOMER A. HERR,
President and General Manager,
Automatic Centrifugal Company.

What Price Titles?

A title conferred upon an individual for services rendered is a worth-while consideration. It is his privilege to capitalize thereon and continue to grow, producing more and better.

The results of this growing and producing will naturally command better financial consideration, as there is always a market for quality products. Thereon depends the justification from the individual's standpoint.

—R. B. HUYETT,
Pangborn Corporation.

Should Overhead Be Uniform?

The system used by a machine shop could not be used by a trucking or concrete road-building concern. The main overhead of the trucking company consists of housing, maintenance, and replacement due to wear on trucks. A flat rate per hour of operation is not adaptable to this line. The concrete road-builder must work from another angle. His trucks, mixers, and hand tools are used in proportion to the number of men employed. The percentage of labor cost can be adapted to this type of work.

The system in our shop is a machine-centered type adapted to our problems. Machinery in each department is classified according to its value, size, space occupied, power requirements, supplies, and supervision. Each class is termed a unit. The wage scale of operating the various classes of machinery is kept within prescribed limits. The overhead for each unit is taken as a percentage of labor, based on the hourly expense of that unit. Due to the limitation of labor cost per hour, the expense can be prorated against the average labor cost per unit without appreciable error. A monthly check of unit overhead rate against actual costs by the plant accountant keeps him advised of weak spots. Changes are not made as soon as possible error is found, but recurring errors result in adjustments to the rate found faulty. This system is being operated at a clerical cost of about three per cent of productive labor.

—HERBERT C. ROBBINS.

Who Should Do the Firing?

If a man does not fit into the place in the department for which he has been hired after a fair trial, he should be dismissed by the foreman. This adds to the foreman's prestige and puts him in a more advantageous position with his men. Due to the close check that foremen are asked to keep on cost, the average foreman is going to have the smallest possible labor turnover.

After a man has been dismissed and sent to the employment office, the employment agent should question him as to the reasons for which he was discharged and then check up with his foreman. If the employment agent is not thoroughly satisfied that the man has a fair trial, he may place him in another department, with a warning that it will be his last chance with the company.

—GEORGE W. GIBSON, *General Foreman,*
Bond Plant, American Radiator Company.

To Whom Should the Chief Inspector Report?

To be effective in enforcing those standards of excellence which are deemed essential to the satisfactory functioning of a machine, the inspection department should be divorced, so far as possible, from all shop influence upon its decisions. Since inspection takes place within the shop, it is difficult but none the less essential to adhere strictly to this policy. Nor should inspectors be drawn into controversies arising from shop disagreement with engineering standards and specifications. These controversial matters should be thrashed out independently of the inspection department, leaving it free to follow blue print instructions only; otherwise, the entire purpose of inspection is defeated.

In jobbing plants, having no engineering department of their own, or working entirely to the customer's drawings and specifications on job lot parts, it is even more important that inspec-

tion should be free from shop influence, since the customer is the best judge of his own requirements. Defective work, which appears passable to the manufacturing shop executive, may have to be rejected by the customer at the cost of great delays and penalities. It is true, that the temptation to accept work almost within the limits is great, in proportion to the loss involved by rejection, and where the loss would be considerable, the sales department and the management should certainly be consulted, since they may well decide upon the advice of the customer himself.

To whom should the chief inspector report? By all means to the chief engineer or to the management. —ALFRED WASBAUER, *Standardization Engineer, Ingersoll Milling Machine Company.*

Should Special Work Be Segregated?

A special department will certainly justify the expense entailed where machine parts are not stocked for current production. Spare parts are troublesome and an expensive gamble, it being all a matter of chance whether they will be required or not. A special shop need not prove expensive. Most firms have some vacant floor space; standard machines, cast-offs from the production shop, can be utilized. If carried out discreetly, the idea is always successful.

A firm in Birmingham, utilized one side of the tool-room, stocked it with standard lathes, and promoted a workman to supervise it. The position provided a jumping-off ground for a more responsible and lucrative position. Fitting, and special machining, was done in the usual departments, but this move did away with the most irritating jobs. The plan worked out exceedingly well, and was, in my opinion, a sign of good organization. —WILLIAM BRYCE, *Sheffield, England.*

Pensions or Leaky Payrolls?

The Federal Trade Commission reported a few years ago that of 250,000 business concerns in this country, over 190,000 made less than $5,000 a year, and more than 100,000 made nothing at all. Out of a hundred average men—at the age of sixty-five—36 are dead, one is wealthy, four are well-to-do, five live on their earnings, and 54 are dependent.

It seems harsh, but it is certainly true, that none but a few of the wealthiest concerns can support any type of pension. If the average man contributed say $5 a month—and he would miss that sum—for a period of thirty years, even with compound interest and judicious investment, the accumulated amount would not sustain him for a great length of time.

I believe the solution will eventually materialize through legislation somewhat on this order: a certain sum will be deducted monthly from every man's pay, and that will be paid to the State. Each industry will be taxed its prorata share for this same fund. The State will administer it, and will receive applications for old-age pensions under certain conditions. It will take time and study to work it out, but the State is the only fit administrator for this problem.

—JAMES K. MATTER, *Supervisor Press Shop, E. G. Budd Manufacturing Company.*

Sales or Sincerity?

In the locomotive plant in which I was engaged as superintendent, 75 per cent of all our troubles were caused by "shaved" delivery estimates. Our sales manager, though told that the deliveries given were the shortest, very often cut my figures.

In spite of all effort in the shop, in many cases the orders could not be completed in the time fixed by the sales manager. In time our plant was known to be always in difficulty with deliveries. One plant meeting after another was called but without remedying the trouble.

Things ran this way a year or so. Then some locomotives on a penalty order could not be delivered on time, and the plant suffered a grevious loss. The general manager gave the strict order that shop figures should never be shortened by the sales manager, even if the order were lost. The effect was that in a few months our customers had forgotten that there had been times when poor deliveries were the order of the day in our plant.

—FRANZ BERMANN, *Consulting Engineer, Vienna, Austria.*

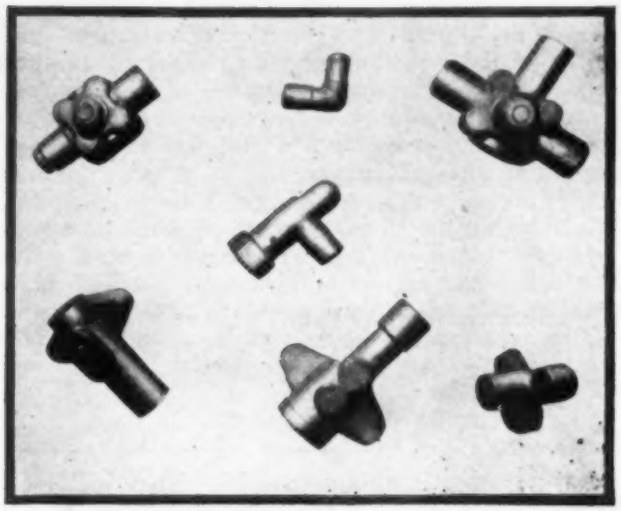
Should Estimates Be Given Operatives?

Without question! I would advocate giving the operative the maximum information possible, and as far as can be arranged, I would permit him to see where every cent of expenditure went. My ambition would be to take him so far into my confidence that he would be convinced in a practical manner that there was nothing to hide, and I would anticipate that business would benefit a hundredfold.

From personal experience, not only have I proved the value of showing him estimated cost side by side with the actual, but I have also assured myself that it is well to resolve each of the estimates into their component parts of material and wages, and then encourage him to criticise them. If this leads him to raise a query on the method of estimating, so much the better for all concerned. If the estimator considers himself so superior to the man in the shops that he is unwilling to listen to suggestions, it is high time that he was replaced by a more progressive individual.

Having organized an estimating department, the writer knows from personal experience that the more the worker is regarded as an intelligent being, the more he will respond, and the better will be the output of both office and workshop. —G. W. TRIPP, *Royal Arsenal, London, England.*

Relatively smooth finish, good machining qualities, and entire absence of blow-holes and porous spots are among the advantages of die-pressed brass



DIE-PRESSED PARTS

Reduce Production Costs

Hot-worked bronze, brass and copper are strong, easy to machine, and involve a minimum of scrap

By HERBERT CHASE
Associate Editor, American Machinist

ALTHOUGH metal-working shop executives know that ferrous forgings present many advantages as compared to castings of iron and steel, it is too often forgotten that brass, bronze, and copper also can be hot-worked to produce similar advantages as compared to castings of the same metals. Forgings of these metals are made today in large quantities but it is the purpose of this article to consider primarily another process termed die-pressing, which, though similar to forging in its effects, is performed in presses or in some cases under a single hammer blow, as distinct from forging under hammers which strike several blows to finish a piece as it is shifted successively to separate cavities in the die.

Die-pressing usually is confined to parts required in considerable quantities and weighing from a fraction of an ounce to several pounds each, but sometimes the superior strength and lower cost of machining the pressed part, as compared to a casting, warrants the cost of dies even for parts produced in relatively small quantities. Heavy parts can be made in certain cases if the section lends itself to the process and presses of sufficient capacity are available.

This process, which originated in Germany, was brought to this country by the American Brass Company, and equipment for making the stampings was set up in their Ansonia plant prior to the war. Hence this company's experience in production of die-pressed parts is long and varied. It has been made available in the preparation of this article.

The die-pressing process, which will be described in more detail in a later article, consists in feeding to the presses hot slugs of measured length and sufficient volume to fill the die and produce some flash. When the ram descends the metal is forced into every recess of the die, forming a dense and uniform pressing which comes out quite accurately sized. Parts thus formed are allowed to cool and then are delivered to ordinary punch presses where shearing dies are used to remove the flash and in some cases to perform certain punching and broaching operations. After pickling and cleaning, the parts are ready for machining.

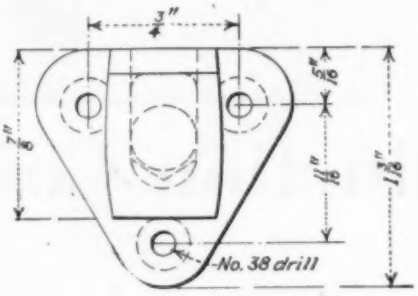
Die-pressed parts of brass or bronze usually have a tensile strength of 45,000 to 56,000 lb. per sq.in., depending upon the alloy used, while ordinary brass castings have a tensile strength which usually runs from 27,000 to 33,000 lb. per sq.in. In addition, the die-pressed part has a much closer grain structure and is entirely free from porous spots and blow-holes; the dimensions of unfinished surfaces are readily held, in the average case, within 0.005 to 0.010 in. of the nominal size.

WHERE close tolerances are needed it is customary to allow $\frac{1}{64}$ in. on a side, or a total of $\frac{1}{32}$ in. in diameter for finish on small parts, and $\frac{1}{32}$ to $\frac{1}{16}$ in. for corresponding dimensions on the larger pressings. Any letters or numbers required on the parts are readily made sharp and clear, and the finish of surfaces is so smooth that buffing often can be done without grinding.

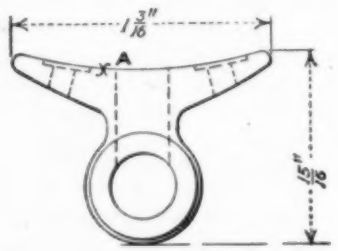
Die-pressed parts usually can be chucked or held in jigs with very little if any filing or fitting; they can be finished at higher speed and with much less tool wear than castings. Since the allowance for machining is considerably reduced, less metal need be removed, and scrap, as well as the weight of the unfinished piece is decreased correspondingly. These items, taken together with the fact that blow-boles and porous spots never

occur to cause the partly or fully machined part to be scrapped, and that a lighter section often can be used because of the greater strength of die-pressed metal, result in marked production economies. These soon offset the difference in die costs, as compared to patterns for sand casting, especially if a considerable number of parts are to be manufactured.

There are, of course, many sand castings which cannot be duplicated in brass or bronze pressings, especially where much core work or undercutting is required. It is possible, however, to make pressings with straight holes having a depth at least equal to their diameter or tapered holes of even greater depth, if the location of the hole is such that the punch will clear itself. Undercuts are possible also under certain circumstances, and dies designed to part in two planes at right angles to each other make it feasible to produce pressings which, at first glance, seem impossible of production by a die-pressing method.



Several specific examples of savings effected through the substitution of die-pressed parts for sand castings are given in following paragraphs:



In the brass oil burner elbow shown in Fig. 1 the blanks from the dies weigh about 2 oz. each. The saving in decreased weight alone amounted to $3.75 per thousand pieces. At least 5 per cent of sand-cast elbows were found to leak after machining. The loss on this score amounted to $1.10 on each thousand pieces, none of which occurred with pressed parts. Some further savings resulted from the higher average machining rate and freedom from drill breakage. Die cost on this part amounted to about $130 and, since the American Brass Company maintain dies without charge, regardless of total number of pressings produced, this charge is not repeated when dies wear out. 1,500,000 of the parts in question were produced in one year with a total saving in that period to this particular purchaser in excess of $7,000.

In the case of the castor roller shown in Fig. 2, which formerly was made as a brass sand-casting, the die-pressed part was found to effect a direct saving of $46.50 per thousand, as shown in Table I.

Table II—Relative Cost of Cast and Die-Pressed Trap Bonnets

	Sand-Cast	Die-Pressed
Material, 0.651 lb. @ 24.125c. per lb...	.....	$0.1571
0.937 lb. @ 19.5c. per lb.....	$0.1827	.....
Labor, machining.....	.0266	.0133
stamping, polishing, plating and inspection.....	.0175	.0175
Overhead on labor.....	.0441	.0308
Rejections, labor and overhead (5% of .0882).....	.0044	..
Rejections metal.....	.0054	.....
Total cost of production.....	$0.2807	$0.2187

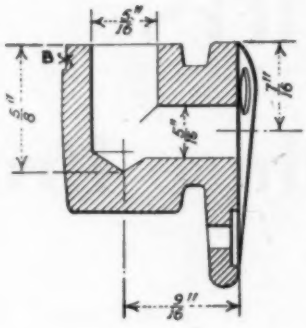


Fig. 1—Die-pressed brass oil burner elbow on which a saving of $7,000 was made in the production of 1,500,000 parts, as compared to sand-castings

With sand-cast rollers tool upkeep was high, chucking was difficult and hubs often were off center. Polishing necessitated removal of considerable metal, and the time required varied from lot to lot, making piece-work impracticable. Rejections sometimes amounted to 20 per cent. The change to die-pressed parts resulted in uniformity in size, material, and chucking, and permitted elimination of roughing-in and finish cuts. Moreover, both machining and polishing were readily put on a piece-work basis. Four finishing operations with an output of 40 per hour were reduced to two, "greasing" and buffing, with better average finish at the rate of 100 an hour. Tool upkeep and other incidental expenses were reduced. The die cost on this job was only $90, and was rebated in material cost. Material cost in this case was not altered since the slightly higher cost per pound of the die-pressings offset the saving in weight.

Fig. 2—A cost reduction of $46.50 per thousand pieces was made when this castor roller was made as a die-pressing instead of a sand-casting. Dies cost only $90

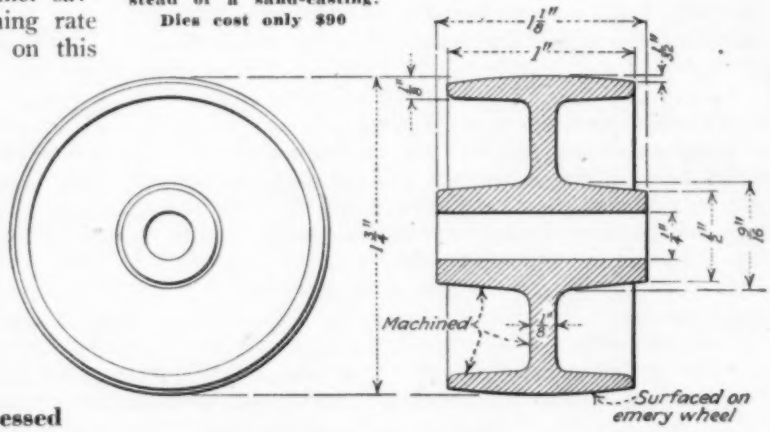


Table I—Relative Cost of Cast and Die-Pressed Castor Rollers

	Sand-Cast	Die-Pressed
Material per 1,000.....	$90.00	$90.00
Machining per 1,000.....	37.00	15.00
Polishing per 1,000.....	47.00	22.50
Total.....	$174.00	$127.50

Cost reduction amounting to more than 20 per cent is being realized in certain items made by a large manufacturer of brass traps used in heating systems as a result of the substitution of die-pressed parts for those formerly cast. Purchases of die-pressed parts by this company amount to over 700,000 lb. a year, and they are used in all cases where the design of the part makes die-pressing feasible. Although the cost *per pound* of the pressed part shown in Fig. 3 is nearly 25 per cent greater than for castings, the permissible saving in weight makes the cost per piece unfinished less. (The die cost for this piece, long since rebated in material costs, amounted to $175.) Moreover, machining and other costs are decreased, as Table II indicates. Other pieces made from die-pressings by this company show marked savings in grinding preparatory to plating and in the elimination of name plates in favor of letters made in the part when it is pressed.

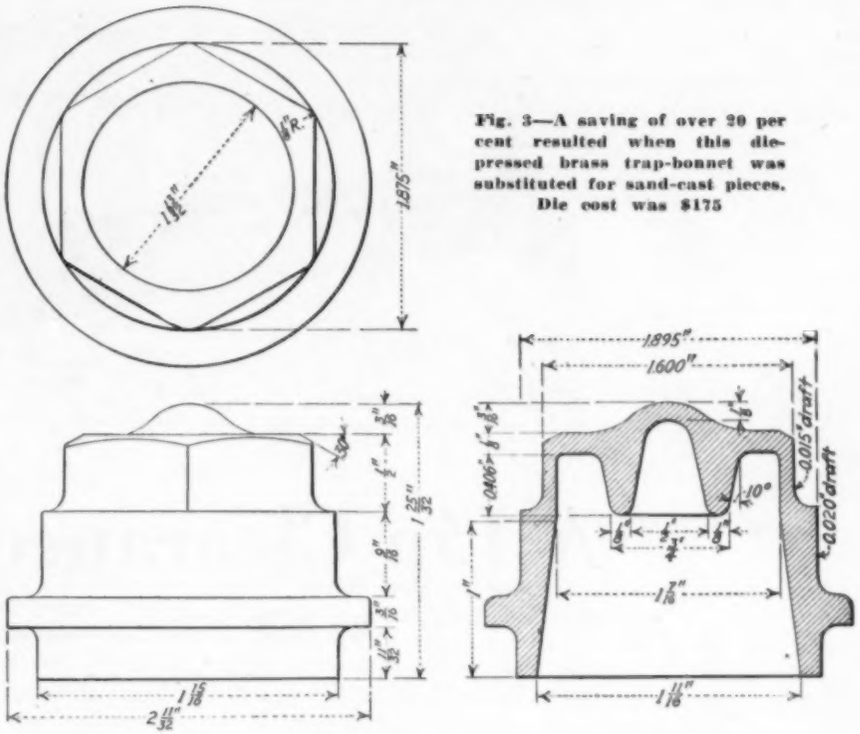


Fig. 3—A saving of over 20 per cent resulted when this die-pressed brass trap-bonnet was substituted for sand-cast pieces. Die cost was $175

These three examples are believed to be typical of the savings resulting from the use of die-pressed parts. Similar savings cannot be realized in every case, of course, for conditions vary in each instance. It is apparent, however, that the possible saving of pressings as compared to castings should be investigated in any case in which many parts are to be made, unless the shape of the part obviously is not suited for production in a die.

Other copper-base alloys beside brass, including aluminum bronze, "nickel-silver," alloys containing manganese or tin, such as Tobin bronze, and non-corrosive metal, such as Everdur, can be die-pressed and are used in this form for many parts in which superior tensile strength, greater hardness, freedom from season-cracking, or superior resistance to corrosion are factors of importance. Most die-pressed parts are made, however, from an extruded brass containing 58 to 62 per cent of copper, 1.5 to 2.5 per cent of lead, and the balance zinc.

In a later article the process of making die-pressed parts, the equipment employed, and the types of dies used will be described.

Support for Machine Tool Research
Discussion

By John Edwards

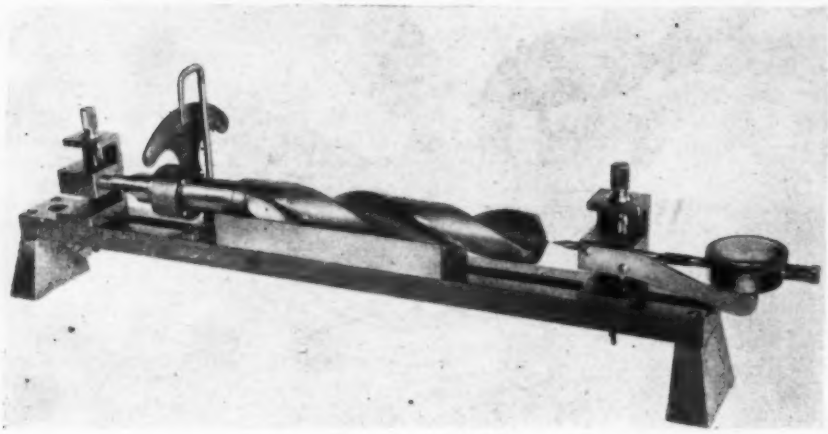
IN *American Machinist*, on page 757, Ernest DuBrul, General Manager, National Machine Tool Builders Association, turned the big guns upon my criticism of the machine tool industry (page 462, Vol. 72) for failure to support university research. Mr. DuBrul is, I believe, entirely correct in his statement that the users of machine tools have more to gain from research than the makers. It would, therefore, appear that logic is on his side when he demands that such research be paid for by the users rather than by the machine tool builders.

But the fact remains, and I do not see how it can be denied, that machine-tool builders stand very definitely to profit by effective research. Such research, properly handled by competent men, will accelerate the improvements of machine tools. With accelerated development, it will be necessary for the user, in his own interest, to replace his equipment more frequently in order to take advantage of the operating savings possible with new, improved tools.

Practically, it all simmers down to this. As far as abstract justice is concerned, the user ought to carry the major burden of such research. If Mr. DuBrul or any one else can figure out how to induce the user to do so—fine! If this cannot be brought about, why should the tool builders "bite off their noses to spite their faces?" It is to their interest to see that such research is carried on, and if necessary, to give it a little financial support in the shape of discounts on machine tools for experimental purposes.

Mr. DuBrul, I think, placed unnecessary stress on the futile and picayune type of research work. No one advocates that machine tool builders shut their eyes and start handing out machines promiscuously to all universities that think they want them; but certainly there is enough intelligence in the industry to find out which institutions and which men are capable of and accustomed to getting results.

In closing, I wish to repeat what I said before, that German manufacturers are "getting the jump" on American manufacturers in this matter.



A Lip Clearance Gage

By A. P. GWIAZDOWSKI

Assistant Professor,
College of Engineering, University of Michigan

Describing an instrument for measuring twist drills to secure accuracy in grinding

IN HIS research work at the University of Michigan, Professor O. W. Boston used a device for measuring the lip clearance of twist drills. So valuable has this instrument proved that it was recently redesigned by the writer to incorporate several improvements suggested by Professor Boston.

The point of a drill is often confused with the dead center. The point is the entire cone-shaped surface at the cutting end while the dead center is the small sharp edge at the extreme end of the point. The size of the cutting lips fixes the location of the dead center. If the cutting lips are equal, the dead center will be exactly centered on the axis of the drill. Assume that the dead center is properly located and the lip angles are correct. The drill may still refuse to bite the metal and merely rub without penetrating; heat will be generated, and finally the drill will split along the center.

This condition is due to the lack of lip clearance or relief back of the cutting lips. So in grinding drills the following must be kept in mind:

1. Lip clearance
2. The location of the dead center in relation to the center line of the drill
3. Angle of the lips

Proper lip clearance decreases thrust, heating, and power consumption; it increases drill life and rate of penetration; it sizes the hole more closely. For precise work or for the purpose of testing the drills themselves, an accurate measure of lip clearance is needed.

The lip clearance gage uses three V-blocks, 4 in., 6 in., and 8 in. long to support different sizes of drills. Referring to Fig. 2, three collars C, of various tapers to accommodate different drill shanks, support protractor P. Pointer base B slides back and forth in a slot to regulate the position of the pointer in respect to the protractor. Brackets A and D may also be moved along the base to suit the size of the drill. Bracket D carries a tracing point T which is held in contact with the drill by a spring. Motion of this tracer is registered by the dial indicator at F. Screw E has 40 threads per inch so that one turn produces a vertical motion of 0.025 in. for the tracer. Screw G is used to adjust the center block in the same way. Flat gages, not shown in Fig. 2, are used to set the tracer and center for a 9/16 in. drill; other adjustments above this are taken care of by the screws.

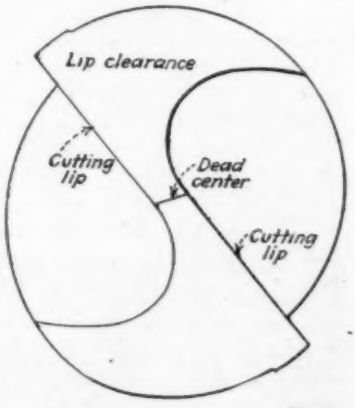
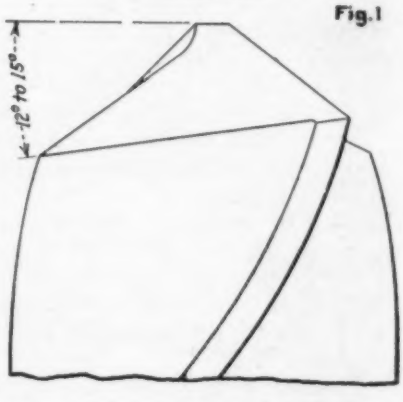


Fig. 1



Professor Boston* describes the use of the instrument in deter-

mining the power required in twist drilling as follows:

"In each case after grinding, the drill was measured on the special measuring instrument, which employed a dial gage with its spindle placed parallel to the axis of the drill, but off center to make sure that the cutting edges at the periphery were advanced to the same relative position or lead to cut chips of equal thickness. Newly sharpened drills were again reground if one lip was in advance of the other by more than 0.001 in. This precaution was taken to eliminate any influence on the test results of any chip thickness other than that desired. If, for instance, a drill one inch in diameter had a variation in lead of one cutting edge over the other of 0.005 in., which is not uncommon in drill grinding, and the drill was being fed into material at the rate of 0.013 in. per revolution, the advanced cutting edge would remove 0.0115 in. feed per revolution, while the lagging cutting edge would remove only 0.0015 in. Inasmuch as thick chips are removed more efficiently, that is, with less power per cubic inch of metal removed per minute, than thin chips, the resultant torque and thrust, in the case of uneven chip thickness, might not equal those for a correctly ground drill.

"The clearance angles were determined graphically, with the use of a universal drafting machine, after rolling the twist drill over the back of a sheet of carbon paper placed on plain paper, and taking measurements from the print on the plain paper.

"This actual clearance angle was also determined more accurately by the special clearance measuring instrument for one point back of the cutting edge, adjacent to the chisel edge, and a second point back of the cutting edge, adjacent to the periphery of the drill. The dial-indicator reading was set at zero for each position, when the point of the indicator rested directly on the cutting edge. The drill was then rotated 3 deg., and the new dial-gage reading observed. The dial-gage readings adjacent to the periphery and chisel edge were carefully determined for the drills for each increment of 3 deg. for a total rotation of the drill of 60 deg."

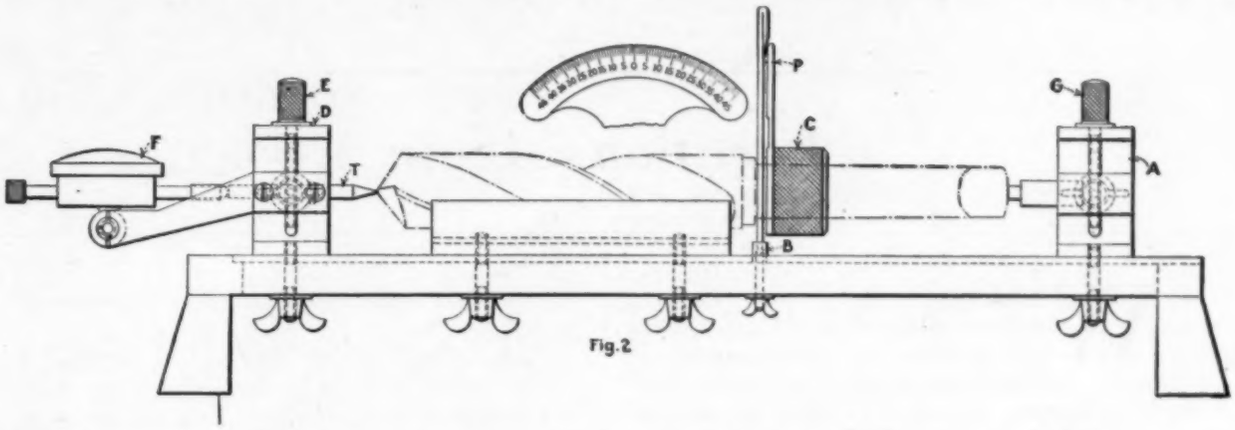


Fig. 2

*"Power Required to Drill Cast Iron and Steel," by O. W. Boston and C. J. Oxford.

Flexible Shaft Possibilities

By John E. Hyler

THE FLEXIBLE shaft machine is coming to the fore in a very strong way. A few years ago, it was considered fit to use on only the very lightest of work, but it seems that this was just another illusion. There are now a great many uses to which the flexible shaft is put in the metal-working and other trades. In the automobile field, for example, it is widely used for disc sanders and polishers.

Perhaps the most valuable applications of flexible shafts are in instances where they are used in connection with other machines, since it is possible to guide them to the work easily. For instance, a flexible shaft grinder can be used in combination with a shaper for certain jobs. Again, some difficult grinding jobs can be easily performed in the lathe by fastening a flexible shaft grinder on the tool carriage. These are only two of the many applications which can be found.

For freehand work, there are many places where the flexible shaft grinder is particularly handy. For grinding or dressing down welds, it is a tool much used, and in many other places, such as the rough grinding of heavy castings, it has proven its worth. It is a boon to the die maker and the metal pattern maker. Rotary files can also be used in connection with the flexible shaft, and they can be had in a good many different shapes, thus facilitating the job of getting into close corners.

Seeing the advances which flexible shafts have made in the past few years, one is prone to stop and wonder how far they will yet go. The sizes in which they are now made would indicate that they may be applied in many other places. One thing is certain: the flexible shaft has a wide field of application which as yet has hardly been touched.

ALUMINUM is slowly but surely findiing its place in machine tool design. High speed parts that never were satisfactory when made of the heavier materials run smoothly when made of aluminum or its alloys. Jig and fixture bodies can be so lightened as to save time and effort in handling. And parts of machines, such as overarm supports on milling machines, are much more portable when made of some of the new lighter alloys. Floor loads may also be reduced if lighter metals can be used sufficiently in machine construction.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

THE · FOREMAN'S

Vacations Again

"WELL! Well! Well! If here isn't my old friend, Ed, all dressed up in a brand new mantle of gloom. What's the matter now, old top? If it's anything serious I won't laugh at you, much as I feel like laughing this morning. Come on, let's eat while you relate your troubles."

"When a man has real trouble he has to smile or be thought yellow, but when he is only irritated he can grouch all he wants to, thank goodness, and I sure am peeved right now."

"How come?"

"Well, I came to work whistling this morning, and everything went fine until Williams came 'round on his morning trip. I was right out in the aisle, like a welcoming committee, and the first thing he said was: 'Say Ed, I wish you and Bill Smith would get together and settle on your vacations.'"

"'Why?' says I, 'I am going to take the last two weeks in August, like I always do.'"

"'But Bill has put in for the same two weeks and claims precedence because of seniority,' Williams said. Wouldn't that make anyone gloomy?"

"Yes, but what difference does it really make? I heard you boast a half-dozen times that you could go anytime because you owned your own camp. Bill doesn't, and maybe he can't go any other time."

"No, I don't think so. I believe Bill is just trying to force the seniority stuff. What difference does his longer service make? He don't work any harder than I do, does he? Well, he isn't going to get away with it. Those two weeks are mine, and I am going to have them."

"All right, big boy; don't glare at me. I don't want your two weeks. But I am curious to know how you would fix vacations if not by length of service."

"I think when a man chooses one certain time he should have the preference for it, and I told Williams so plainly."

"Sure, but why play with a loaded gun? That don't get you anywhere. What did he say to that?"

"He said that a vacation was a privilege and not a right, and that if they could not be chosen without conflict, an order of preference would have to be worked out. But he hoped it wouldn't be necessary."

"That don't help you a bit. Incidentally, I happen to know Williams has been giving a lot of thought to shutting down the plant and giving everyone a vacation. He maintains that, when they are strung out so, the plant runs inefficiently for half the year. He says that if there are enough people to run it during the summer vacation, then there must be too many in the winter."

"But how could you do that, Al? How about orders?"

"Well, it's not so easy in a shop that does contract work, but lots of plants do it, and after all it's a matter of habit. If we told our customers that we were going to shut down for two weeks, they would get their orders in earlier—and probably shut down also."

"That's all right with me, as long as it is the last two weeks in August."

In what order should vacations be chosen? How many foremen should be absent at once? Why should the clerical force receive a vacation and not the shop? Is a total shutdown feasible?

Idea suggested by Charles R. Whitehouse,
Chief Time Study, The Holtzer-Cabot Electric Company.

Foremen are invited to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

Smoking During Working Hours

THE practice of extending smoking privileges to the office staff or others, when in the factory, and denying these privileges to the workmen is unfair to the workmen.

If "No Smoking" signs are up because of the fire hazard connected with the manufacturing operations, the enforcing of the signs will be a simple matter, because workmen have repeatedly shown that they are in complete sympathy and accord with the management where a real fire hazard exists.

On the other hand, there are many concerns which, under the guise of the insurance companies' regulations, prohibit workmen smoking during working hours, but allow smoking before starting time, during the noon period, and after quitting time. Other concerns, of my knowledge, allow smoking by any one at any time on the night shifts. Higher executives, including those whose signatures appear on the no-smoking orders, have been known to break their own rules repeatedly. Those priding themselves on being the most fair and liberal minded recognize the craving felt by some men and appear not to notice their occasional stealing away to have a quiet smoke.

Could anything be more illogical? Is it not a well known fact that fires are less likely to break out from smoking when the smoking is done in the open where everybody can see the smoker? If a fire should break out it could be extinguished much sooner than if it were started in some obscure place not frequented regularly by employees of the plant.

—F. L. INGLERIGHT, *Superintendent, Bradford Motor Works.*

I DO not believe that the office force should be allowed to blow smoke rings through the machine shop during working hours even though they may smoke in their own department. Smoking is a bad habit, not only from the standpoint of physical and mental health, but from the standpoint of efficiency of production and safety from fire. I do not think that the office or engineering force should smoke during working hours at all, but if they must indulge, it is much better that they refrain from causing the shop men to have a hankering to slip away to a toilet room and have a pull at a "coffin nail." To allow the office force to smoke is to lower efficiency and increase fire hazards. As a factory owner once told me, "If anyone burns the factory down, let the stockholders do it."

—GLEN MACOMBER.

I HAVE worked in a shop where smoking inside the building was entirely forbidden, and in one where smoking was permitted only before working hours and during lunch time, in still another where the men had a half-hour period in the morning and after lunch for their smokes.

Where smoking is permitted before working hours or during certain periods, there always are individuals who stretch their smoke past the allotted time. These same individuals usually find it necessary to retire to the wash-room several times daily for their smoke. Unless rules are strictly enforced, smoking periods encourage smoking on the sly rather than discourage it.

I have come to the conclusion that entirely forbidding smoking in the factory building is the best solution to the problem. This order should also include office men and visitors. There should be little trouble in enforcing the order with the office force, and visitors generally comply with the order when their guide discards his cigar upon entering the factory where "No Smoking" signs are prominently displayed.

—ARTHUR FETTER.

DISCORD between shop and office employees is notoriously easy to create, and its potential evil is often under-estimated. Rules that afford the office force personal liberties not accorded to the shop workers should be avoided whenever possible, but separate rules afford not the slightest excuse for infractions.

The prohibition of smoking is perhaps one of the most difficult rules to enforce, and often requires drastic measures. Office workers and visitors should certainly never be permitted to make this enforcement more difficult by smoking in the shop.

—GILBERT G. COOMBS.

⁂

New Drills and Old Men

THE best way to get older men with obstinate natures to fall into line, is to find out their reason for objecting and then get around this difficulty.

A case of this kind came to my attention some time ago when a new wage payment plan was being introduced. Some of the older men objected on general principles and even stated that they would go home before having their jobs timed with a stop-watch.

The plan followed was to time those who were willing, and it so happened that by increasing production a higher wage was possible. This condition was spread out as far as possible, but neither the foremen nor time-study men went near the objectors about the new plan. After a short time the objections faded away and the obstinate ones were taken into the fold.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

⁂

Too Much Co-operation

THE conditions mentioned apply to nearly every class of manufacturing operations, particularly where the sequence is separated into departments each of which has a tendency to become a little world of its own. The finished product is often lost sight of in the many duties of running a sectional department efficiently. In a large

discussion is not limited to foremen. Letters accepted and published will be paid for

or medium sized manufactory a give-and-take policy is very necessary to smooth and efficient working. A department which is often passing bad or faulty work on to the next department presents a condition which the "super" could soon correct if there is an adequate inspection section responsible to the super for the work as it is passing to the various departments.

The executive functions vary with conditions, and in a high grade shop the tendency will be to co-ordinate. In a lower grade shop, where the departmental work does not come up to expectations for accuracy, the tendency will be to arbitrate.

In my opinion, a foreman can certainly be a good fellow and a good foreman, if by being a good fellow is meant being just, fair, straight, and honest. These qualities do not denote weakness and should not make him one bit less a disciplinarian. —ARTHUR BRAMWELL, *Potter & Johnston Machine Company.*

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Foremen and the Wage Bonus

THERE are several valid objections to giving a foreman a bonus, all directly affected by the way his department operates. The foreman often becomes "bonus crazy" and stalks the department like a wolf, his eye seeking one thing and one thing only, a chance to earn another bonus. In the meantime a hundred and one little details slip by unseen behind his back, each one a loss to the company.

Discontent with the amount of bonus given has ruined many a good foreman. A discontented leader soon has a department of discontented followers, and production slumps.

In the nature of things a foreman should have better standing with the company than the men. This standing is either lost or undermined when you place both on the same bonus footing. In the final analysis, both foremen and men are being paid for the same thing when a bonus is given, that is increased efficiency. Pay the men anyway you see fit, but if you expect your foremen to continue to earn bonuses do not hamstring them from the start. To do so discourages them from giving long years of service to any one plant, one of the main advantages of the yearly bonus plan.

—E. R. SHIELDS, *Processor, Oakland Motor Car Company.*

*

Ethics of Making a Change

EVERY man tries to work at something he likes. But none of us work for our health's sake. I doubt that there would be many people working if it were not for the pay check; that pay check usually represents the standard price paid for the class of work done.

Ed is probably getting the standard rate. While the plow works offers twenty per cent over this rate, Ed may rest assured that he will earn every cent of it. There is usually some reason for a higher rate.

Ed should play square and let Williams read the letter. He should ask for a couple of days in which to make a decision and promise to notify Williams at once. And finally, when he has decided, he should tell Williams that he likes his present job, that he likes the men with whom he is associated, and that he has always been treated fairly by his superiors. He should further state that he is anxious to earn as much money as possible, and would rather do it where he is than go elsewhere for it, but that, on the other hand, he does not expect more than his services are worth. —C. P. SHERMAN.

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No Verbal Orders Accepted

AS LONG as five-sixteenths and nine-sixteenths, and similar combinations sound about the same, errors will happen. It is neither possible nor practical in the average shop to do away entirely with the taking of verbal instructions—especially over the telephone.

It is, however, entirely practical and essential to give the workman either a rough sketch or at least a piece of paper with the dimensions on it. That localizes responsibility as far as the foreman and the mechanic are concerned. The foreman, to protect himself, should check back over the phone, or in person, and enter the dimensions in his note book. When the job is large, he should insist on a dimensioned sketch.

In a large plant the finest alibi-destroyer in the world is to have a telautograph receiving set in either the planning or shop office—depending on where the work starts for the shop—with sending sets in the engineering department, and at other points where work originates.

—JAMES K. MATTER, *Supervisor, E. C. Budd Manufacturing Company.*

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Keeping Machines on the Job

A GOOD maintenance man is invaluable to a busy foreman, but he must, of course, be given to understand clearly just how far he can go in shutting down machines for repair.

In a department where production runs high and where schedules must of necessity be adhered to, the foreman must be the man to decide whether a certain machine can be pulled off the line.

I do not believe the question is one of authority—the machine being without doubt as much a part of the foreman's job as the man who runs it—but rather one of close co-operation.

A good maintenance man knows how every machine in his department is behaving. He knows when an hour's work in making certain replacements will avert a more serious breakdown.

He sees to it that the necessary parts are on hand and keeps his foreman posted on the condition of the machines so that he can plan on the loss of a certain machine for the required length of time.

—NIELS J. SORENSEN, *Ford Motor Company.*

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Mottoes in the Shop

ADVERTISING a bottle of patent medicine, a box of chocolates, Safety First, or Anti-waste requires the designer to be well grounded in the principles of mass psychology. You may tell an individual that he is a fool or a slave, and if you address him in a popular manner as one of a crowd he will applaud, but if you address him as an individual to his face he will cut up

rough. Accordingly statements which would roil a workman if addressed to him in the form of a personal letter will simply ruffle the surface of his thoughts if he sees them on a placard. At first a strange placard may amuse him or call forth ironical comments, then he will forget it. But the constant repetition of seeing it will cause the idea to sink into his subconscious mind where it will work, unknown and unseen.

Diplomatic questioning in a machine shop with about 300 workers, concerning various mottoes, produced the following interesting results. About 5 per cent regarded them as generally obnoxious and an insult to human intelligence. About 15 per cent were ready with intelligent criticism of the subject matter. About 20 per cent were apparently wholly unimpressed. About 60 per cent had only a hazy recollection of the actual wording or form of the placards, but the questions revealed that the desired impression had been produced.

—H. J. BURNHAM, *Birmingham, England.*

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Boss, or Advisor?

AN intelligent foreman reads his men and settles questions arising in their shop relations with tact and discretion, by directing, suggesting, and instructing.

Often a workman is more knowing, touching the work at hand and the best manner of setting up and doing it, than his foreman. To such a man a foreman will be a consultant or advisor and not a boss, thereby building good feeling, good production, and shop morale. To a poor workman who lacks the skill of a good man, or is dilatory in his habits and a clock watcher, the foreman can be a boss in a radical sense.

Shop men and management alike are human. Forbearance and a kindly manner backed by knowledge, determination, tact, and manly conduct on the part of the foreman, will create an atmosphere of harmony, confidence, and good fellowship, and will lead to co-operation that will accomplish much better results than the spirit of "I am it" on the part of a foreman.

—HOMER A. HERR, *President & General Manager, Automatic Centrifugal Company.*

*

Keeping Machines on the Job

MACHINES that are idle when most needed can be considered not only an overhead expense but a deterrent to the department. In a small department or shop it would be practical to place both the responsibility and the authority in a maintenance man, for it would be possible for him to check the machine placed in his care successfully.

In large departments where there are more than two hundred machines it would be advisable to place the authority in the maintenance man and the responsibility on the foreman. The honest co-operation of the man at the machine with the maintenance man and foreman can eliminate a lot of lost time. All scrap is not due to carelessness on the machine operator's part. Often the condition of the machine is responsible for it. The man at the machine can tell when it is not in good working order much more quickly than any number of maintenance men.

—C. J. PESHEK.

New Drills and Old Men

THE purpose of sound business organization is to earn profits on the capital. It is a duty of all connected with the corporation to assist the administration to make the business profitable. Those who believe otherwise should be dealt with accordingly.

Williams being a man of authority, would not have invested in those new drills if they had not been better and more economical than the old drills. He made a master move, and it is a duty of all men in the shop to show appreciation and sincerity by doing everything they can to make the new drills a success.

However, if Bill Jackson is incapable of realizing this, the foreman should explain it to Bill, man to man, telling him gently but firmly that these drills are to be successfully operated whether Bill approves of them or not.

Bill either understands the meaning of the foreman's explanation and falls in line, or refuses to understand. If he does not understand, he should be laid off for about a week to give him time to balance his judgment. In the meantime the foreman should train a bright young man to take Bill's place.

Modern machines are much simpler and require less skill to operate and produce good work than the old machines.

If Bill comes back, he will have learned his lesson, and the foreman will have an additional man for an emergency. If he does not come back, nothing will be lost, for the fewer men of Bill's type we have in modern industry, the better for the industry. The energy dissipated in acting diplomatically with stupid people of Bill Jackson's type would better be directed to constructive purposes.

—MARTIN B. CHAMARA, *Mechanical Engineer, American Radiator Company.*

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The Ethics of Making a Change

SATISFACTION with a position means a lot, but it doesn't help put the boy through college, or buy gas for the "flivver."

If Ed is really worth twenty per cent more than he is getting, it would indicate that either the concern he is employed by at present is too small to meet the increase, or else his ability is not fully recognized and appreciated. In either case, he would be justified in accepting a position which would offer greater opportunity for advancement.

Al's "What price loyalty" idea is certainly novel and has many good points, but it appears to imply disloyalty in case Ed should accept the position offered. Most employers, if they could not meet the offer, would advise him to accept, provided they considered the proposition a good one.

—LEONARD J. KOCH.

* * * *

THE · NEXT · TOPIC

"Material Handling"

A Simple Checking System to Reduce EXCESS COST

By GEORGE W. DUNHAM
Consulting Engineer

WHY DO products, especially machines or other fairly complex assemblies, have a way of costing more than carefully prepared estimates of time and material indicate that they should cost? Usually the answer can be found in certain items that could not be foreseen when the estimates were made. Such items arise from a great variety of sources or combinations of circumstances. Sometimes they are intermittent or occur so infrequently that their presence is considered of no special account, although, in the aggregate, the cost is considerable. At other times the fault is not reported to those responsible and consequently continues to recur, whereas a very simple change would prevent it.

Probably, so long as the human element is present, such excess cost items cannot be eliminated; but a very simple system, employed by a certain manufacturer of washing machines with whom the writer was associated, has resulted in reducing these items materially as compared to the original list. A corresponding reduction in excess costs was effected at the same time, for the cost of operating the system was almost negligible. The required information was collected and tabulated without any increase in personnel and proved surprisingly helpful because it showed up automatically faults that were easily remedied, for the most part, when attention was centered upon them by the checking system. In this instance the system was applied directly only to the final assembly and test department, but it is readily applicable to other departments or to almost any kind of manufacture involving fabrication and inspection.

The washing machine produced by the company mentioned comprises a universal electric motor driving by belt to a reduction gear which drives, in turn, a reciprocating mechanism for the washing basket and a rotating mechanism for centrifugal drying of the articles washed.

Reports from the inspectors provided the desired information, taking up the problem where the cost department left off. In the single department mentioned the system showed initially that about thirty-five items were increasing the cost unnecessarily. Most of these were individually of minor importance to the over all result. Part of them were known to someone in the organization, and some of them to the heavily burdened foreman in charge. Their collection brought all of them, in a group, to the attention of the management. Taken as a whole, they were seen to be of such importance, that a strenuous and systematic effort to improve the situation was initiated. A number of items were eliminated almost at once, a goodly portion over a reasonable period of time, and the occurrence of those three or four things which could not be done away with was reduced to a reasonable and satisfactory percentage. These latter are now held in control, and new items which develop from time to time, are promptly detected and stopped, usually before they are evidenced in the cost figures.

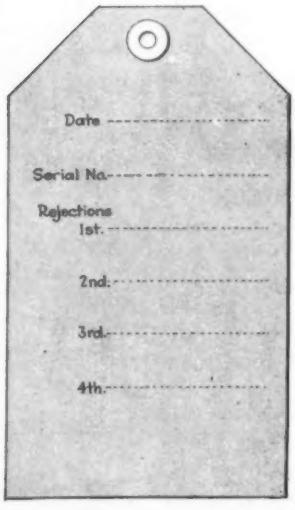


Fig. 1—Tag filled out by inspector and attached to the machine. The numbered lines are marked successively each time the machine fails to pass inspection. The cause of rejection is noted below or on back of card

In the department under consideration the product was assembled, tested, inspected and packed progressively, with a small storage space just ahead of the testing operation to provide reasonable flexibility at that point. Special tags, such as that shown in Fig. 1, were provided. They contained printed space for the date, serial number of the unit, and four numbered lines to be initialed successively if a rejection occurred more than once. These tags were given to the testers, who were also semi-final inspectors, with instructions to fill them out, and to note on the back the reason for rejection if the machines were not passed. The final inspectors were instructed accordingly.

ONE immediate result was to make it clear that a greater percentage of machines were rejected a second or even a third time, than any one appreciated. Final inspectors collected the tags indicating acceptance, and these were dropped into a box to be sorted and the data transferred the following morning to a daily column in

the weekly report sheet, shown in Fig. 2. The list of items on this sheet was typed in and changed each week as the data on the cards varied. Additional items were added whenever a new defect came to light. This procedure had the advantage of showing at a glance the exact condition each week, and provided a definite current list upon which engineers and foremen could concentrate in efforts to eliminate faults.

SIMILAR information could be collected by operation or finished-parts inspectors with like results. Naturally the use of the forms will vary for different departments, but the results will be the same.

Figs. 2 and 3 show a report of an early date and another about eight months later. The difference is startling. In the former, but 61 per cent of the machines tested during the week passed the final inspection, while in the latter 98 per cent were passed; and none of the machines that failed to pass the first inspection in the later report, failed to pass the second inspection.

During the same period the number of items causing rejection or requiring attention before passing inspection was reduced from 37 to 3. A large proportion of the items eliminated were found to have passed earlier inspections without rejection. Others, such as dents and scratched paint, had been caused by careless handling after such inspection. Both these causes for rejection were eliminated readily by insisting upon proper inspection before assembly operations had made it more difficult and expensive to apply the remedy.

Another group of defects, including some items involving noise or excessive friction, were remedied by settling closer dimensional tolerances or seeing that tolerances already set were maintained more rigidly. A closer inspection of certain items, such as motors and switches, purchased from outside sources, also prevented defective parts from being assembled into the machine before the defects were discovered.

Week Ending 3/9/29

FINAL ASSEMBLY & TEST
Inspection Analysis & Production Troubles

MODEL - - - - -

Date		3-4	3-5	3-6	3-7	3-8	3-9	Total	%
Machines accepted - on 1st insp'n		76	52	61	86	64	30	338	47
- on 2nd	"	18	19	14	19	7	4	81	11
- on 3rd	"	4	2	3	1	1	1	12	03
- on 4th	"								
Total accepted	-	98	73	78	76	72	35	431	61
Serial number	- from								
	- to								
Machines rejected	-	22	33	57	46	80	37	275	39
Total tested	-	120	106	135	121	152	72	706	
Slap in gear box	x	3	8	9	5	18	6	49	06.9
End play in gear box		11	5	15	11	28	4	74	10.4
Slow motor or stiff machine	x	2	4	7	1	2	7	23	03.2
Leak W.S.R.		2		2		2		6	00.8
Tank dented	x	1		1	1		2	5	00.7
Noise (anywhere in machine)	x		2	4	3	6		15	02.1
Leak at unit gearset gasket				3		4		7	00.9
Leak at seam of tank	x	4	5	8	12	3	4	35	04.9
W.S. drive sleeve loose on shaft				4	7	6	2	19	02.6
Galv. off spinner post	x		1	3	2			6	00.8
Tank out of round	x	1		1		1		3	00.4
Decalcomania defective	x			1				1	00.1
Defective switch			1		1	1	3	6	00.8
Leak at drain			2		3	1	1	7	00.9
J-44 loose					1			1	00.1
Decalcomania off		2	2	1		1		6	00.8
Basket defective		2	4			4		10	01.4
Control tight		2		2				4	00.5
Motor pulley loose on shaft		2						2	00.2
Defective electric cord		2						2	00.2
Clip loose at rivets		1	1					2	00.2
Belt off			1					1	00.1
Switch on wrong			2					2	00.2
Spinner post leaning	x		1					1	00.1
Water leak at gearset gasket			4			2		6	00.8
Worm shaft pulley loose			1	1	1	1		4	00.5
Name plate off				1		1		2	00.2
Galvanizing off S.P.				3	2			5	00.7
Motor noise					1			1	00.1
Tank paint off	x				1			1	00.1
Snap-ring not plated					2	4		6	00.8
" " groove too deep					1	2	4	7	00.9
Unit tight (gearset stiff)	x					6	6	12	01.6
Watts high(defect mtr.or excess frict.)	x					1		1	00.1
Electric cord short						1		1	00.1
Dowel out						1		1	00.2
Adjust belt						2		2	00.2
TOTAL		35	43	66	56	98	38	336	

x Rejected

Fig. 2—Weekly tabulation sheet showing causes of rejection on final inspection, made shortly after the system of checking was installed. Thirty-seven causes of rejection are noted. Figures near the top of the sheet show that many machines were rejected two or three times

The net result of the system was to reduce the excess cost on completed machines to a small fraction of the former cost and thereby to increase the spread between factory cost and selling price—a most desirable accomplishment, especially in a highly competitive market.

In effect, the method outlined is merely one of keeping a convenient record of shortcomings in the manufacturing process as they arise, and of making these shortcomings so apparent, through a simple tabulation, that those in authority get a quick picture of the situation and can go straight to the roots of the troubles. It has the merit of avoiding tedious, uninteresting, and expensive analyses such as accountants often devise, of providing a certain stimulus to avoid unnecessary expense, and of getting attention for items that otherwise appear negligible.

Week Ending 11/23/29

FINAL ASSEMBLY & TEST
Inspection Analysis & Production Troubles

MODEL - - - -

Date		11 -	18	19	20	21	22	23	Total	%
Machines Accepted - on 1st insp'n			63	55	38	75	76	38	345	98
- on 2nd	"									
- on 3rd	"									
- on 4th	"									
Total Accepted	-		63	55	38	75	76	38	345	98
Serial Number	- From		14834	14898	14953	14988	15064	15140		
	- To		14897	14952	14987	15063	15139	15178		
Machines Rejected	-		0	0	2	2	2	1	7	02
Total Tested	-		63	55	40	77	78	39	352	
Slow Motor of Stiff Machine	x F.I.				2	2	1	1	6	01.7
Noise-Motor Pulley unbalanced			14	2	2				18	05.1
Short-Motor to Frame	x						1		1	
Total			14	2	4	2	2	1	25	

x Rejected

Fig. 3—A week's tabulation made about eight months later than that shown in Fig. 2. All but three items causing rejection have been eliminated, the total rejections reduced to two per cent, and no machines fail more than once to pass inspection

How Small Japanese Shops Build Bicycle Parts

By Fred H. Colvin
Editor, American Machinist

BICYCLES may almost be said to be the universal means of transportation in Japan, especially in Tokyo, Osaka, Yokahama, and a few other cities, where they swarm the streets as automobiles do in American cities. They are used mostly for business, for errands, and for delivering all sorts of merchandise. With such an extended use it would be natural to suppose that bicycles would be manufactured in a few large plants and by the latest production methods. But such is not the case. Instead, there are many small shops making bicycle parts which are shipped to fairly large assembling plants in some cases, while in others the assembling is done in a small way for strictly local trade.

One district in which there are a number of these small shops is what is known as Sakai, outside Osaka, once widely known as a place where the swords of the Samurai were made. The forging of swords has given way to the less romantic but far more practical manufacture of parts for bicycles, including the forging of cranks and axles, the stamping and machining of sprockets, and the like. The axle is forged solid with one crank, both parts being machined on very old and simple machines, either converted engine lathes or turret lathes of light design, hand operated. Where the axle is not solid with one crank, the end is knurled, forced into the crank which has been corrugated to match, and the end of the axle riveted over. This is usually done by a roller tool while the parts revolve in a lathe. In the case of the loose crank, however, I saw several special machines that had been designed and built to drill the crank for both the axle and the key or cotter pin at the same setting. These were semi-automatic machines, the operator merely loading the fixture, the two drills at right angles following each other through.

Sprockets are for the most part cut off square from strip steel of suitable width, and a hold punched or drilled in the center. About a dozen of these plates are mounted on a mandrel and then turned round in a lathe. The plates are usually staggered so as to present eight corners to the cutting tool instead of four. When turned to the proper diameter the design of the sprocket is punched, both to lighten the disk and to give a distinctive design. It is this desire to have special designs, each dealer of any size demanding his particular sprocket, that forces the use of the crudest methods in the punching.

Sectional dies are used, sectional in this case meaning that each hole in the sprocket has a separate punch, made of a block of steel of the required shape. The design of sprocket shown in Fig. 1, for example, requires ten separate punches and the sprocket requires three blows of the press to complete it, the sprocket being indexed one-third after each stroke.

A sort of cross-section of the punching device is shown in Fig. 2 where the loose punches are in place at *A* being located by a guide plate *B*, which would be a stripper plate if the punches were not forced through the sprocket. The sprocket itself is shown at *C*, centered by the axle hole and capable of being indexed one-third after each blow. The die or base plate is at *D*, this being also hardened and having the necessary clearance for the punches, both for the proper shearing of the metal and for allowing scrap and the punches themselves to drop through. Then the sprocket is indexed, the punches placed in the guide plate *B* as before, and the next section is punched. In Fig. 3 is shown the loose punches set into the guide plate.

Punching is done on a screw press of the friction wheel type having a bed or platen so that a man can work at it from both sides. Each man has his own set of dies and the fixtures and arranges the punches in position in the guide plate. Then, each man takes his turn at the machine, pushing his punching device under

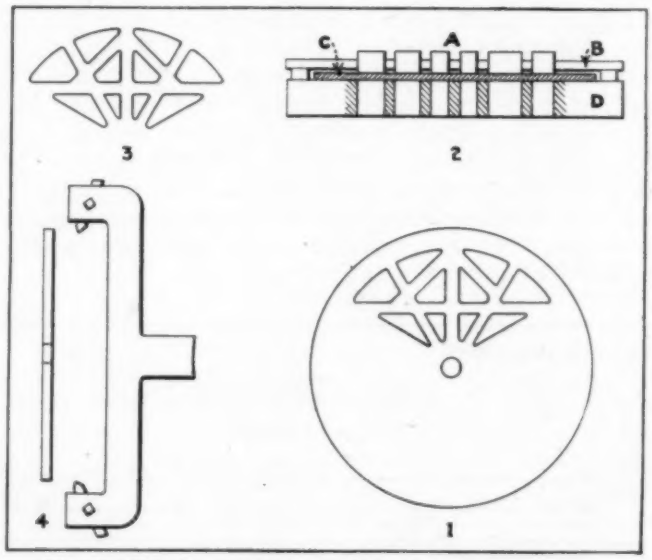


Fig. 1—Bicycle sprocket punched in three operations. Fig. 2—Section of die with loose punches in place. Fig. 3—Loose punches required for one operation. Fig. 4—Double tool for finish turning sprocket

the press and withdrawing it to make the set-up for the next third of the sprocket. Needless to say the operation is painfully slow, even though the operators become very skilled in arranging the punches.

Sprockets are finished singly so as to have the outside run true with the center or axle hole. They are bolted against a suitable plate, using the hole as a guide, the outside being finished to size by the double tool shown.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

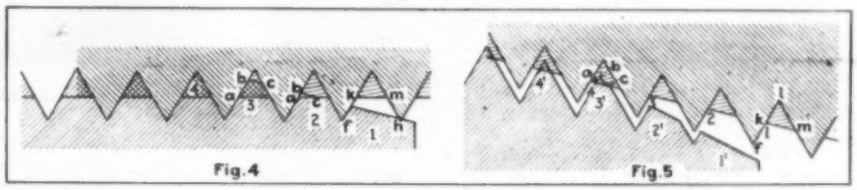
Preventing the Breakage of Small Taps—*Discussion*

BY WM. S. ROWELL

REFERRING to adverse comments on my method of tapping full threads in highly-resistant material, I will take them up in chronological order. On page 25, Vol. 72, of the *American Machinist*, R. H. Kasper tells of encountering trouble that has never been mine, though the method described (page 1020, Vol. 70) has been used for years in tapping full threads in resistant alloy-steels. It is difficult to understand how a second tap, used as described, could fail to follow the grooves made by the first tap, or why removing a portion of the metal should cause more breakage of finishing taps than by removing all of it with one tap. Even supposing that the second tap could be induced to deviate from the path of the half-thread tap, it should, and does, work more freely and should be less subject to breakage, because of the first operation. It is also difficult to see why, when the second tap has been forced out of position, it would not tend to correct part, or all, of this error in deep tapping.

In Fig. 1, a thread tapped in two passes is represented in section. The first tap being a half-thread tap, and removing the metal indicated at *a*, *b*, *c* and *d*, the remaining portion of the thread groove *a*, *b*, *g* and *f* is removed by a normal tap. In Fig. 2 is represented a case where the finishing tap has been forced out of position and has removed a portion of the thread indicated at *e*, *g*, *i* and *c*, at the same time leaving *f*, *e*, *k* and *a* as an offset on the other side of the groove and thread. A case where the finishing tap equally divides the portion of the thread remaining after tapping with a half-thread tap is shown in Fig. 3. The metal removed by the finishing tap in this case is represented by *n*, *m*, *o*, *p*, *q* and *r*. In this extreme case (providing the first tap was exactly half thread) there would be just one-half thread (*g*, *m*, *n* and *i*) left in the nut, the inner- or small-diameter half being entirely removed by the finishing tap. This condition is about what many persons advocate; but if a half thread is wanted, it is clear that the inner half would be removed more quickly and more easily by an oversized tap-drill.

The only place known to me where a full-thread tap does not readily follow a half-thread tap, is in tapping with taps having a quick taper—say $\frac{3}{4}$ in. per ft. or more. In such taps, the part threads of the tapered lead ends cannot get in their work of positioning the threads of the finishing tap until after its full threads have begun cutting. A similar condition would obtain in case the finishing tap were a bottoming tap without taper at the lead end.



Figs. 4 and 5—Holes that have been tapped with half-thread taps, showing the action of full-thread taps in following. The first hole is straight, while the second is tapered. Straight and taper taps, respectively, have been used

In Figs. 4 and 5 are shown the conditions present in finish tapping with full-thread taps, holes that have been tapped with half-thread taps. In Fig. 4 is shown in section a parallel hole that has been tapped with a half-thread tap that has left metal, represented by *k*, *l*, and *m*, to be removed by the full-thread tap. Although this tap has been given a lead taper of three threads only, it will be seen that before even the small amount of metal represented by *a*, *b*, and *c* has to be cut, the tap is well guided and positioned in the half grooves *f*, *k*, *m* and *h* by the part teeth of its lead end.

A similar section, but of taper tapping is shown in Fig. 5. Although this tap has not entered far enough for the part teeth of its tapered end to be guided in the

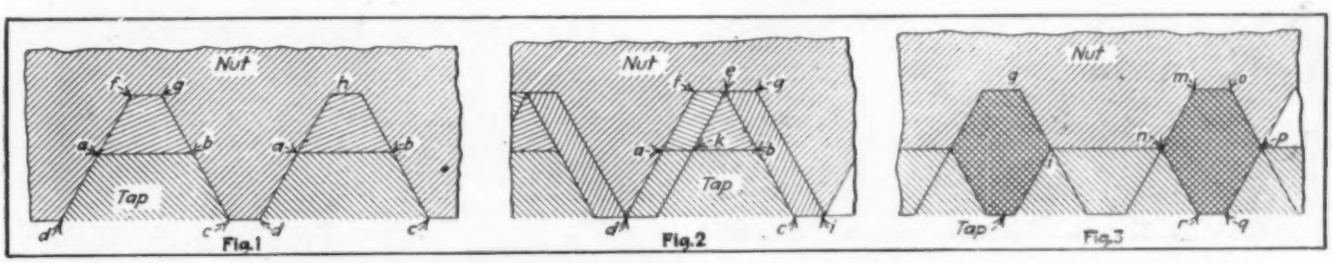


Fig. 1—Section of thread tapped in two passes. Fig. 2—Thread in which the finishing tap has been forced out of position. Fig. 3—The result of the finishing tap cutting half a thread ahead of the half-thread tap

half grooves *f*, *k*, *m* and *l*, its full threads have been cutting *a*, *b*, and *c* without anything to position them centrally with the work done by the half-thread first tap.

On page 65, Vol. 72, Andrew J. Schwartz advocates a heavy reduction of the tapped thread by enlarging the drilled hole; saying that in removing a portion of the thread from a first tap, the metal is removed from the wrong place. I advocated the removal of a portion of the first tap thread for tapping *full threads in highly-resistant metal.*

To some of us, it seems that advocates of oversized tap-drills often run to extremes. There are many places where the use of an oversized tap-drill is correct practice, but trying to cure all tapping ills with oversized drills is asking too much of one remedy. Probably more breakages and other troubles are due to the improper grinding and use of the taps than from all other causes. Taps come from the makers properly ground for through tapping, but often so heavily relieved as to cause cuttings to crowd in and make trouble in reversing. In tapping with a lubricant, the right one should be used. A rather heavy mixture of white lead and lard oil is a good lubricant when tapping steel.

Mold for Relining Laird-Type Crossheads

By J. H. Hahn

A very convenient mold for relining Laird-type crossheads is shown in the illustrations. The usual practice is to reline the crossheads with a special composition of white metal containing a large percentage of copper. When a crosshead is to be relined, the old metal is melted off by submerging the crosshead in molten lining metal, contained in a cast-iron vat. The surfaces to be relined are thoroughly tinned, using solder and muriatic acid. The crosshead is placed in an upright position against the mold as shown in Fig. 1, and the metal is poured in at the top. The base plate is of cast iron and is supported on four short legs. The mold is in two parts, which are held together by three keybolts. The screws *A* and *B* are for separating the halves of the mold after the metal has been poured. They are threaded into one half of the mold and bear against the joint surface of the other half.

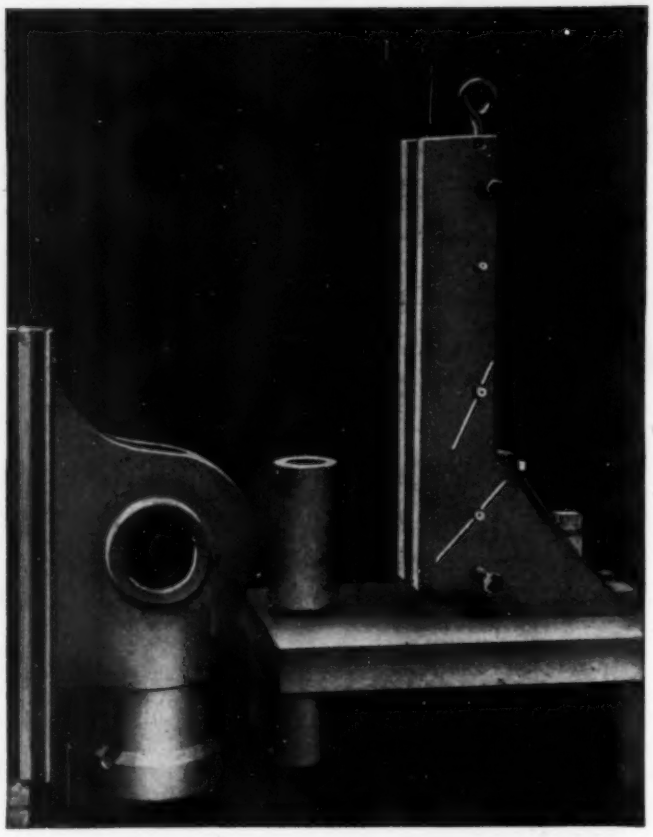


Fig. 1—Crosshead and mold in position for pouring the lining metal

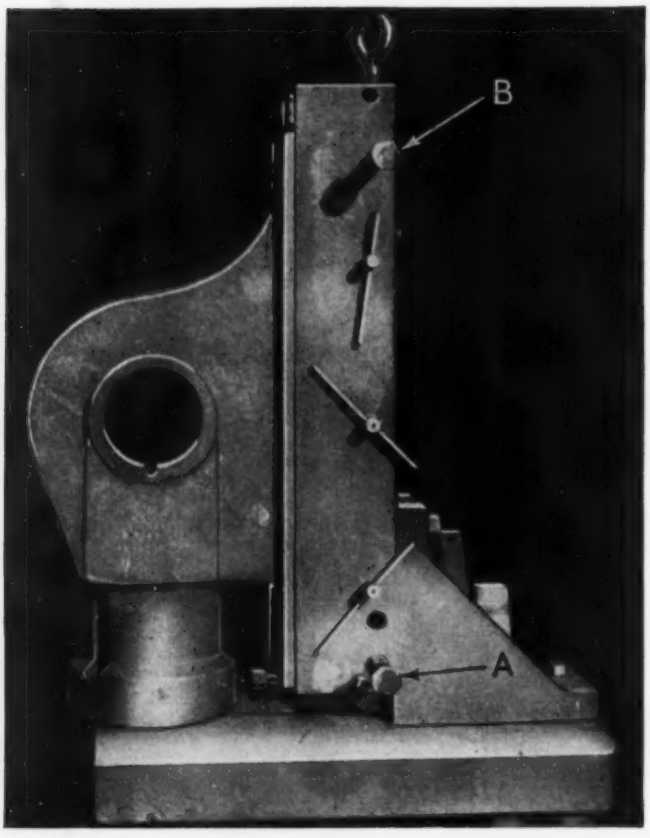


Fig. 2—The relined crosshead, the aligning plug, and the mold

At the left, in Fig. 2, is a crosshead after it has been relined and removed from the mold. In the center is a tapered plug fitting the piston hole and used for keeping the crosshead in alignment with the mold while the metal is being poured. At the right is the mold. It is large enough to permit $\frac{1}{16}$ in. of lining metal to be removed by finish machining to fit the guides. This machining is done on a planer, using gang tools in both side heads, the crosshead being held on a special mandrel during the operation.

Tarring Tanks with a Spray Gun

By Joe Kelly

Various kinds of paints and lacquers have long been applied successfully by spraying, but until recently, this method could not be used with crude coal tar. Previous attempts to spray coal tar resulted in clogging of the supply line and spray gun, as its rapid solidification on cooling soon built up a stoppage.

A satisfactory method of spraying this material has

now been developed in the tank shop of Gilbert & Barker, Springfield, Mass. The tar is heated by steam coils in a storage tank and fed by gravity to a smaller pressure tank which is also heated. The pressure tank outlet has a $\frac{5}{32}$-in. orifice which controls the velocity of tar flow. By limiting the tar flow in the hot tank, instead of at the gun nozzle, one source of trouble is eliminated. The gun is of an extra large size to do away with all restrictive passages and has a $\frac{5}{32}$-in. bore.

The hose between the tank and the spray gun is wound first with electric resistance wire, then an asbestos coating, and an outer metal sheathing. Electric current continuously heats the hose while in use.

Air is passed through a heating coil in the pressure tank before being supplied to the gun. Formerly one of the greatest difficulties had been the freezing of the tar at the gun nozzle where it was struck by the blast of cold air. Heating the air effectively prevents this.

The tanks to be painted are held in fixtures which allow them to be rotated easily while being sprayed. By using these fixtures and the method of spraying described, the time for the painting operation has been cut in half.

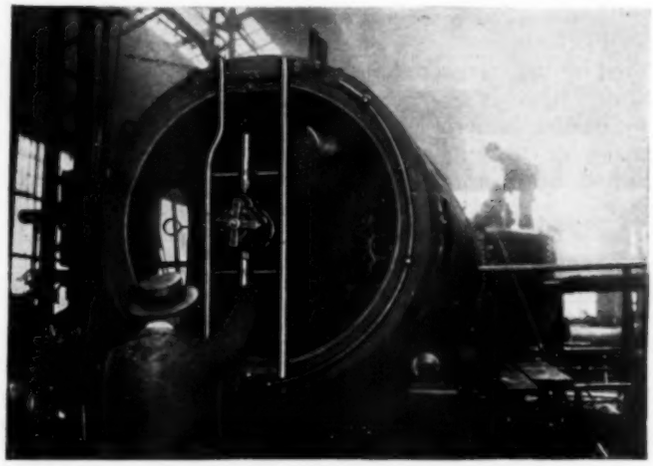
An "Old Man" for Boiler Front Ends

By Fred H. Colvin

"Old men" in machine-shop practice vary almost as much as do their human prototypes. They are frequently makeshift affairs that, while they serve their purpose, are difficult to adjust and are time-wasters. In contrast to almost any makeshift, the "old man" found in the Omiya shops of the Japanese Government Railway, and shown herewith, is of special interest. This, as can be seen, is built up by welding sections of pipe into a sort of ladder that goes across the front end of the locomotive boiler. It is made to fit several sizes of boilers and holds the air motor used in operating the flue expander that sets the flues in the front sheet, or the cutting tool that removes them from a boiler that is to be repaired.

By placing the air motor in the center and using two universal joints together with a telescoping drive shaft, the operator can reach every flue in the front sheet.

Although the term "old man" is usually applied to the device for drilling operations that takes the thrust of the drill, the name seems more appropriate in this case than the more conventional "outer support."



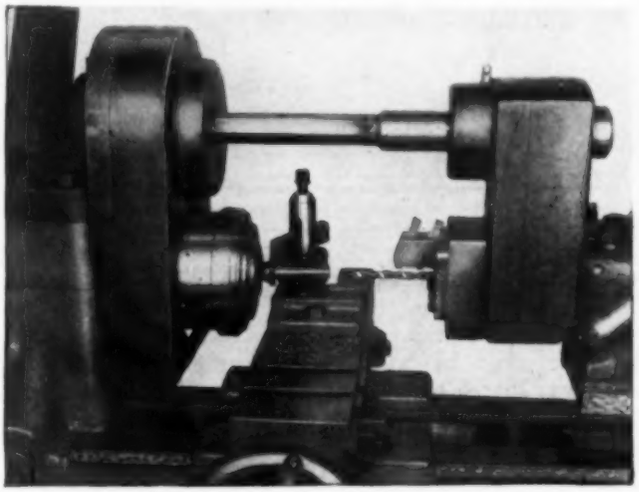
"Old man" for boiler front work

Drill Speeding Attachment

By I. F. Yeoman
Foster Machine Company

When small holes are drilled on a screw machine, the turning speed is too slow and the turning feed too high for proper drilling. Almost any type of screw machine may be provided with a speeding device which will overcome this difficulty.

The attachment illustrated is driven by a gear cut as



When the turret is run back, it may be revolved; then the squared shaft clears the gear housing

an integral part of the spindle hood. A cast-iron housing, mounted on the head of the machine, carries a second gear, driven by the first, with a square hole broached in its bore. This hole receives the square portion of a shaft extending from a drill head mounted on the hexagonal turret. Steps milled into the hub of the gear permit the entrance of the squared shaft while the machine is in operation. The drill spindle is driven from a sprocket on this shaft through a silent chain.

In the set-up shown, turning and drilling are performed simultaneously. The lathe spindle is rotated at a speed suitable for the turning cut. By rotating the drill at an equal speed in the opposite direction, the correct drilling speed is obtained. The turning feed of 0.020 in. per revolution is reduced to 0.010 in. per revolution of the drill spindle.

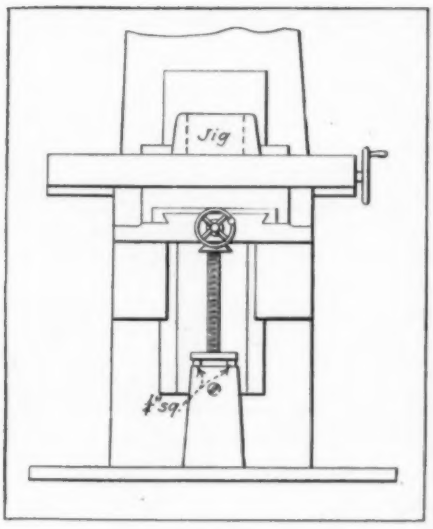
Rotation of both the work and the drill reduces the likelihood of run-out. When high drill speeds are desired excellent results may be obtained by driving the speed device with an electric motor.

Extending the Travel of a Screw

By A. Fontanella

In boring a jig in the milling machine, I found that after I had bored several holes I had raised the knee almost to the limit of its screw, and it still had to be raised 0.023 to reach the point where the lowest hole was to be bored.

My first thought was that I would have to tear down the set-up and reset the jig, blocking it up from the table. However, I got over the difficulty in the following manner: I clamped the knee to the column so that



How the travel of the screw was extended

it could not drop, removed the setscrew that held the nut from turning and ran the nut up on the screw. I then put two pieces of ¼-in. square, cold-rolled steel under the flanges of the nut, one on each side, and screwed the nut down tightly on them, as shown in the illustration.

With the nut in this position, I spotted it with a drill through the setscrew hole and replaced the setscrew. When the clamp was taken off of the knee and column, the knee could be raised ¼ in. further by the screw and I was spared the trouble of tearing down and resetting the jig.

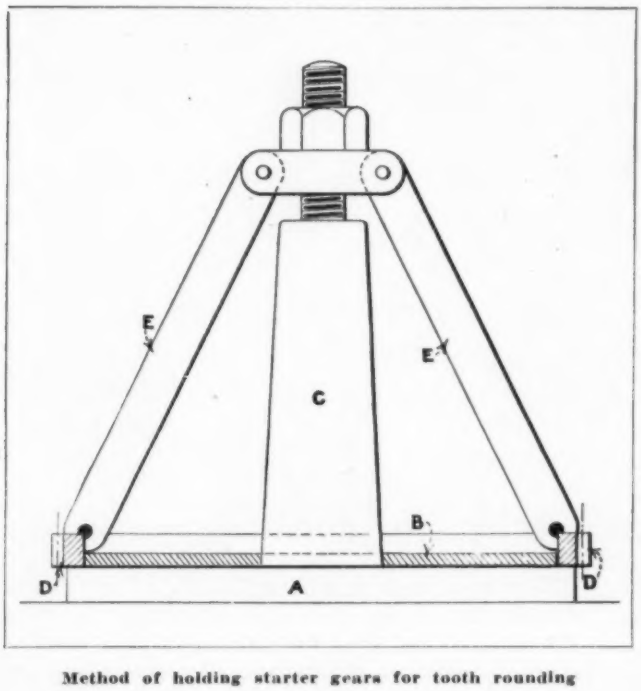
Holding Starter Gears for Tooth Rounding

By I. B. Rich

Gears for starting automobile flywheels are a bit awkward to handle on account of their large diameter, comparatively small section, and varying sizes. Job shops which prepare these for the garages or service stations are faced with the problem of holding them for such jobs as rounding or bevelling the teeth on the end where the pinion enters for starting the engine.

One shop overcame the difficulty by the method shown in the illustration. The base plate *A*, of the right diameter to support the largest gear, is fastened to the table of the milling machine used, and the light plate *B*, which fits the inside of the gear, goes over the central post *C* to locate the ring gear *D* as it is put in place.

There are three holding-down arms *E*, although the illustration indicates four. These three arms equalize the pressure exerted by the nut at the top and enable the ring to be easily clamped in place. Loosening the nut a few turns enables the clamping arms to withdraw toward the center so that the ring passes over them easily in being removed or replaced. Any variation in diameter is also accommodated in the same way.



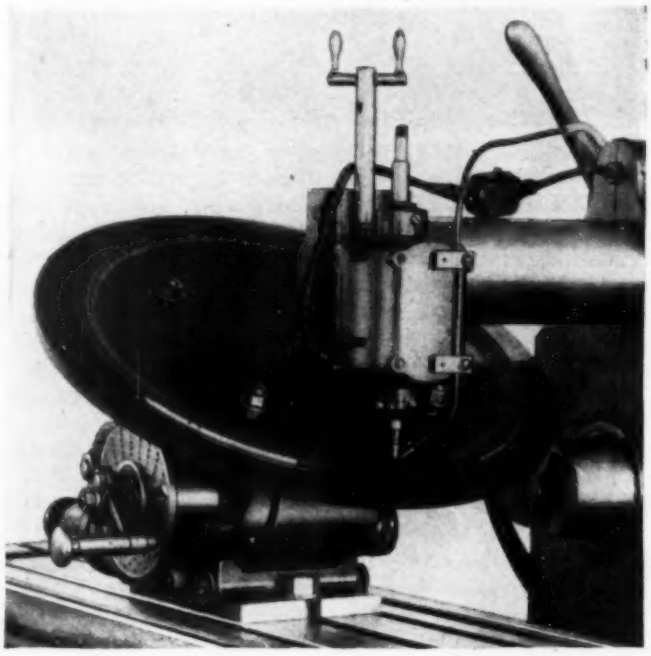
Method of holding starter gears for tooth rounding

A High-Speed Graduating Fixture

By George E. Jacobson

Machinist Quarterman, Naval Research Laboratory

Anyone who has attempted to graduate lines other than on an engraving machine by means of the conventional method of using a V-shaped cutter similar to a threading tool bit, will recall the numerous burrs produced by such a method and the loss of time in removing them. Also, if a piece of work has been finished in any of the modern lacquer or crystalline finishes, it is impossible to put on graduation lines by the cutter method because of the chipping of the finish. This makes a rotating cutter necessary.



Graduating a beveled ring on a milling machine

An obvious solution is the use of the vertical head on a milling machine for the purpose, but the reason for not using it is obvious if the maximum spindle speeds of any of the leading milling machines and engraving machines are compared. These speeds are roughly 700 to 800 for the milling machine, and 5,000 to 6,000 for the engraving machine.

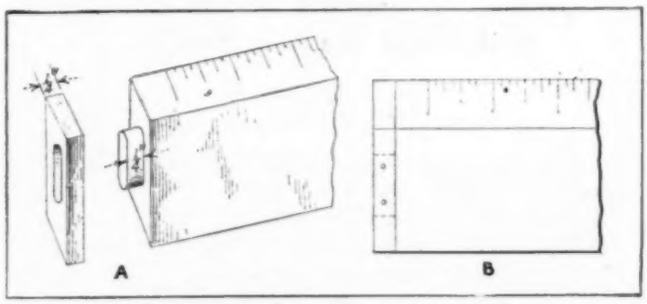
The job illustrated, a beveled-edge ring, 16 in. in diameter, was too large to be graduated on the engraving machine which we had. We did it, however, by the fol-

lowing method: The armature shaft of a center grinder was set up in a bench lathe, backresting the shaft at the after ball race. A tapered hole was then bored in the end of the shaft to receive a standard engraving machine cutter. This hole did not weaken the shaft or interfere with its operation as a grinder in any way. The shank was removed from the grinder and a hole was drilled and tapped in the end of the overarm of the milling machine. The grinder was then attached to the overarm with the same screw that formerly held the shank. The ring to be graduated was then mounted on a fixture on the dividing head. A small tube was attached through which compressed air was blown on the cutting tool to keep the work free from chips. Differential indexing can also be accomplished on this sort of fixture and rings as large as 24 in. in diameter can be accommodated easily.

Protection for Draftsmen's Scales

By H. S. Steele

When a draftsman drops his scale, the celluloid inlay is likely to be chipped or broken, especially if the scale should land on one end. If, however, the ends of the scale are protected by pieces of metal similar to ferrules, there will be no danger of such damage. The ends of



Protecting ends for scales

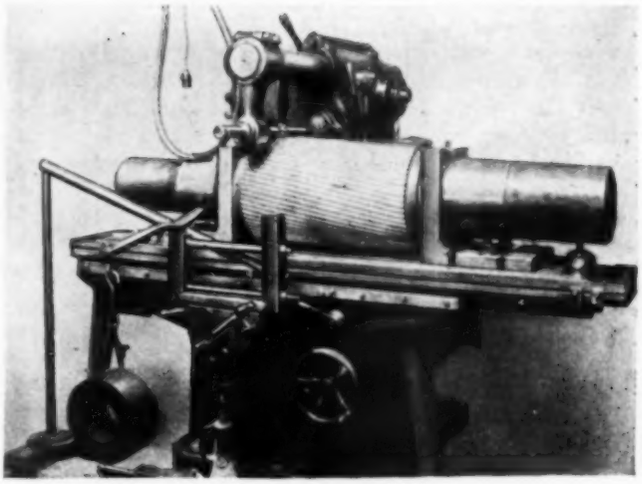
the scale should be trimmed as shown at *A*. Metal pieces, $\frac{1}{4}$ in. thick, as wide as the thickness of the scale and as long as its width, are drilled and filed to fit the trimmed ends. They are then forced over the projections and are held in place by small pins. The metal ends are then beveled at two corners to match the beveled edges of the scale. At *B* is shown one end of a scale with a protecting piece in place.

Cutting Helical Grooves in a Cast-Iron Roll

By George W. Kehres

Plant Engineer, Elkhart Rubber Works

By rigging up the special device shown in the illustration we were able to cut helical grooves in chilled cast-iron washer or cracker rolls on a No. 24 Brown & Sharpe miller. These rolls are used in pulling and grinding rubber, and under ordinary procedure they would be sent outside to a shop especially equipped to handle such work. With freight charges to and from the plant, expense of crating and the like, this repair would cost around three hundred dollars for a pair of rolls. We were able to do the work for $92.50, with



Milling machine rigged up to cut helical grooves in a cast-iron washer or cracker roll

home-made devices applied to the miller as indicated.

These rolls, with the necks and bearings, are about 6 ft. long, the working surface being 2 ft. long and 15 in. in diameter. The total weight is 2,500 lb. For this reason a jack is placed under the knee, in addition to the standard screw support, in order to prevent too much deflection. The job requires two cast-iron brackets, weighing 130 lb. apiece, to carry the rollers, and a means for rotating the roll as the table is advanced into the cutters. Essentially, this consists of a lever arm bearing against an inclined bar. The arm is a $\frac{3}{4}$ x $1\frac{1}{2}$-in. hot-rolled bar, forged at one end in the form of a loop or collar to fit the roll, which is 10 in. in diameter at the bearings. At the outer end of the arm, which is 30 in. long, is hung a weight to keep it in contact with the guide. This guide is simply a $1\frac{1}{2}$-in. cold-rolled shaft pivoted to a bracket at one end and, at the other, supported at the desired angle by a vertical stanchion made of a similar piece of material. The incline is such as to give a lead of 5 in. in the length of the roll. Accuracy, of course, is not essential in this work.

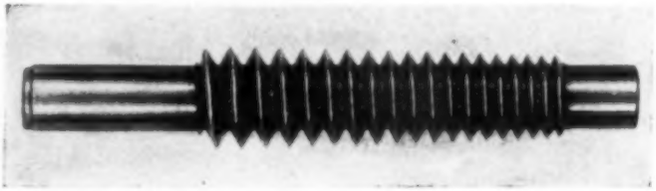
Two grooves are cut at a time to a depth of $\frac{1}{4}$ in., there being 67 grooves in all. On the miller spindle are two standard, No. 3, 7-pitch involute gear cutters, mounted in the usual way.

A Thread Cutting Stunt

By H. T. Collinet

Some years ago, a group of men were discussing different types of threads and the best way to cut them. Someone asked me if I could cut an increasing pitch thread, commencing with a 16-pitch and increasing to an 8-pitch thread in two inches.

After giving it a little study I concluded that I could cut such a thread, and I proceeded to do so. I cut two



A thread with a uniformly increasing pitch

of them, one of which is shown in the illustration. It was neither a mathematical nor an engineering feat, but it was a good example of overcoming ordinary, human inability to see the obvious method. I have shown the sample to many engineers and mechanics and not one of them has been anywhere near right in their analysis of the method used.

In cutting the thread I used a lathe with a 16-pitch lead screw. I removed the screw-cutting gears from both the spindle and the feed screw. To replace these I made two flanged pulleys with a 1 in. face, and keyed them to the shafts in place of the gears. Next, I fastened one end of a strip of $\frac{1}{32}$-in. flexible metal to the pulley on the feed screw and wound it up, leaving enough end to fasten to the pulley on the spindle.

When the lathe was started, the ribbon unwound from the screw pulley and was rewound on the one on the spindle. The speed of the feed shaft increased as the band winding on the spindle increased its diameter, and decreased that of the feed screw.

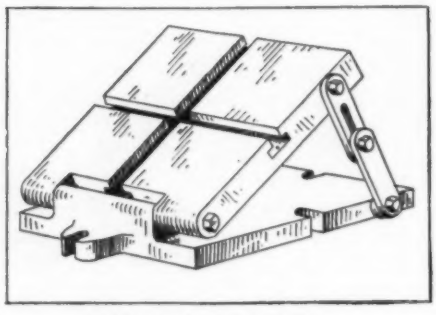
After taking a cut, the metal ribbon was rewound on feed shaft pulley by means of a crank.

I have never found any use for this thread, but the process as a whole might be adapted to some use.

An Adjustable Angle Plate

By Albert Feucht

An adjustable angle plate that has proved adaptable to a wide variety of drilling and milling work is shown in the illustration. It is specially convenient for angle work in the vertical miller, in as much as the height from the table to the work is considerably less in this type of plate than in the type that is hinged in the center—an important consideration when space between the work and the spindle is very limited.



Adjustable angle plate

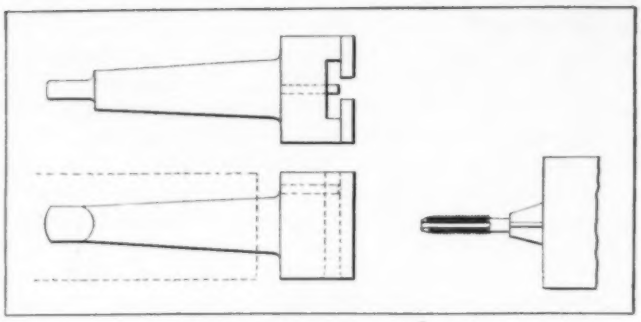
The plate can be locked at any angle by the bolt passing through the hinged section and the pair of adjustable braces near the rear corners. Two T-slots are provided in the top plate. The bottom plate has keyways and slotted lugs for convenience in locating and clamping the device to the machine table.

A High-Speed Tapping Fixture for Small Parts

By C. W. Hinman

Chief Tool Designer, Kobzy Tool Company

In the illustration is shown a fixture for holding a small part in which a hole is being tapped. The taper shank fits into the tailstock of a light speed-lathe, while the tap is held in a reversing tapping chuck in the live spindle. With the work inserted in the T-slot in the front of the fixture, the fixture is moved toward the tap by the hand lever with which the tailstock is provided.



Fixture for tapping small parts

The fixture is positioned so that the T-slot is vertical, and the work is entered from below, being held against a stop pin by the operator's hand. The lower part of the T-slot is bell mouthed for the easy insertion of the work. After the work has been tapped, removal of the operator's hand allows it to fall out of the fixture. The shape, size, and position of the T-slot, and the location of the stop pin can be varied to suit a variety of work, for tapping, burring, or countersinking. We have tapped holes in small terminal ends with a No. 6-32 tap at the rate of 15 pieces per min., using a similar fixture.

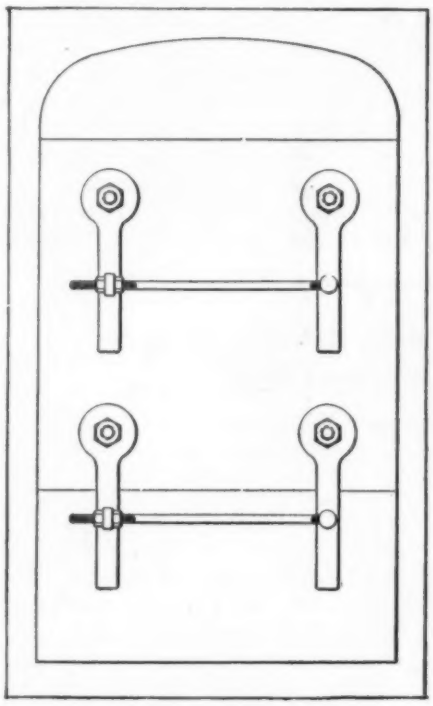
Simplified Binding Device

By Joseph Kopp

Simonds Saw & Steel Company

Many milling machines have a table knee that is bound by four hexagonal nuts when adjusted to the proper height. Loosening and tightening four nuts takes considerable work each time the table is raised or lowered.

Four malleable cast wrenches were made to fit the nuts and were secured by setscrews. A hole was drilled in each for a stud which acted as a swivel. Each pair of studs was then joined by a tie-rod by tapping one and drilling a clearance hole through the other. This made it possible to anchor each rod at one end and to adjust it at the other by means of two check nuts. In this way, one handle was made to operate two binding nuts, enabling the operator to clamp or unclamp the knee with much greater ease.



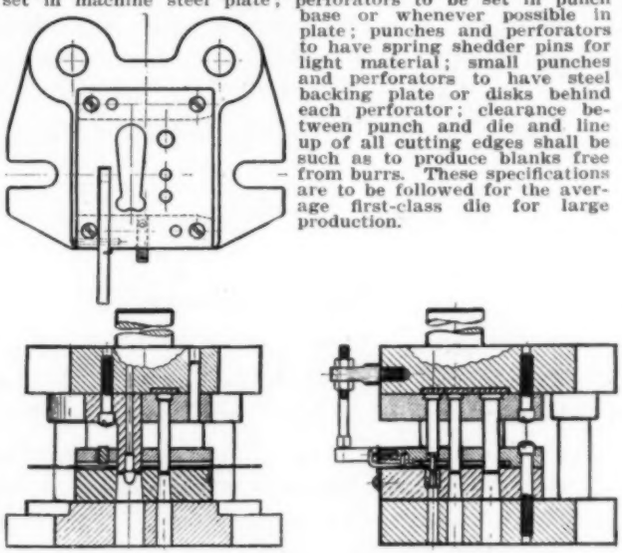
Simultaneous clamp for milling machine knee

Typical Standard Die Sets

Abstracted from specifications of National Die & Special Tool Builders Association

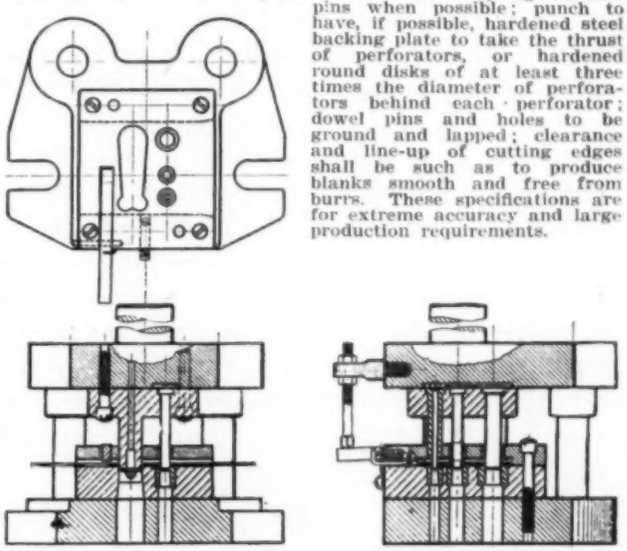
Classification Sheet for Class-A-Die

Dies made under this heading shall be of high-grade workmanship and material suitable for average requirements calculated to give long service for large production and shall have the following important features: Leader pins and bushings to be hardened and ground; automatic stop, first and second stop when necessary; dies to be of proper thickness best suited for the work, preferably not less than $\frac{3}{4}$ in.; cutting parts of the die to be within plus or minus 0.002-in. limits where required; die to have $\frac{1}{2}$-deg. taper for entire thickness, and to have bushings for all small perforating holes whenever possible; stripper plate to be machine steel fitted to punch and perforator; punch to be solid with base or whenever possible set in machine steel plate; perforators to be set in punch base or whenever possible in plate; punches and perforators to have spring shedder pins for light material; small punches and perforators to have steel backing plate or disks behind each perforator; clearance between punch and die and line up of all cutting edges shall be such as to produce blanks free from burrs. These specifications are to be followed for the average first-class die for large production.



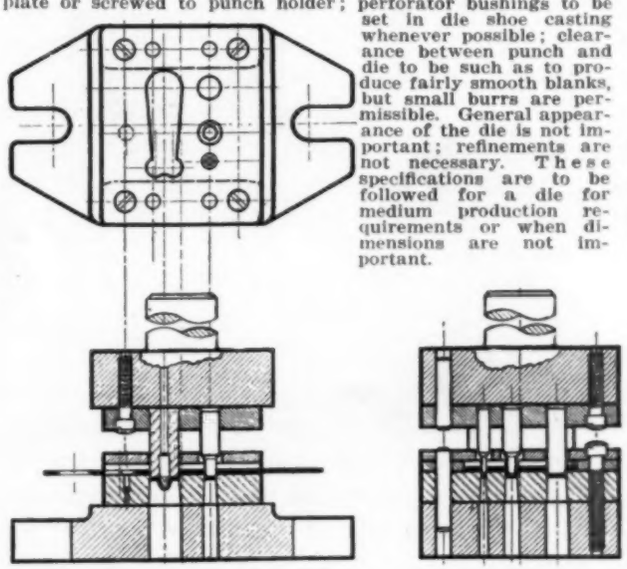
Classification Sheet for Class-A-A-Die

Dies made under this heading shall be of the highest grade in workmanship and material, calculated to give maximum service for large production requirements, and shall have the following important features: Leader pins and bushings hardened, ground, and lapped; automatic stop, first and second stop when necessary; die to be proper thickness best suited for the work, preferably not less than $\frac{3}{4}$ in.; cutting parts of die to be within plus or minus 0.001-in. limits where required; die to have $\frac{1}{4}$ deg. taper for entire thickness or to be nearly straight for about $\frac{3}{8}$ to $\frac{1}{2}$ in. from top, followed by about 2-deg. taper for balance of thickness; die to have bushings for all small perforating holes whenever it is possible to use bushings; stripper plate to be machine steel, fitted closely to punch and to have hardened steel bushings for all small perforators whenever possible; punch to be solid with base; perforators to be set in base of punch when possible; perforators, if smaller than $\frac{1}{4}$ in. diameter, shall be in hardened quills when possible; punches and perforators to have spring shedder pins when possible; punch to have, if possible, hardened steel backing plate to take the thrust of perforators, or hardened round disks of at least three times the diameter of perforators behind each perforator; dowel pins and holes to be ground and lapped; clearance and line-up of cutting edges shall be such as to produce blanks smooth and free from burrs. These specifications are for extreme accuracy and large production requirements.



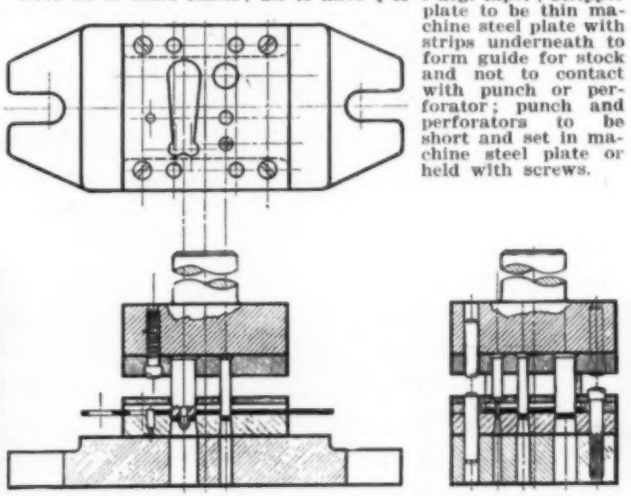
Classification Sheet for Class-B-Die

Dies made under this heading shall be of first-class workmanship and material and shall have the following features: Plain punch and die holders; plain flat or pin stop; die to be of proper thickness best suited for the work, preferably not less than $\frac{1}{16}$ in.; cutting parts of the die to be within plus or minus 0.003-in. limits; die to have $\frac{1}{2}$-deg. taper for entire thickness; stripper plate to be machine steel and not contact with punch or perforator; punch to be set in machine steel plate or screwed to punch holder; perforator bushings to be set in die shoe casting whenever possible; clearance between punch and die to be such as to produce fairly smooth blanks, but small burrs are permissible. General appearance of the die is not important; refinements are not necessary. These specifications are to be followed for a die for medium production requirements or when dimensions are not important.



Classification Sheet for Class-C-Die

Dies made under this heading shall be of first-class workmanship and material, but because of only small production requirements shall be known as temporary dies and shall have the following features: Plain punch and die holders; plain flat or pin stop; die to be $\frac{1}{2}$-in. or less in thickness, according to requirements; cutting parts to be within plus or minus 0.005 in. or more limits; die to have $\frac{1}{2}$ to 1-deg. taper; stripper plate to be thin machine steel plate with strips underneath to form guide for stock and not to contact with punch or perforator; punch and perforators to be short and set in machine steel plate or held with screws.



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Field Facts on Tungsten Carbide

ONE of the difficulties encountered in introducing the new tungsten carbide cutting alloys has been the digging out of the reasons for successes and failures in their applications. Some users are enthusiastic about tungsten carbide, others are correspondingly disgusted with it. Why?

A sub-committee of the A.S.M.E. special research committee on the cutting of metals prepared a questionnaire to elicit this information and mailed it to representative metal-working plants several weeks ago. Some very enlightening replies have come in to the committee but the percentage of returns is not yet large enough to warrant the reaching of any general conclusions.

If you received one of these questionnaires and have not filled it in, please do so, and return it at once. If you did not receive a questionnaire, and would like one, or want to express an opinion, write to the editor of *American Machinist* and your letter will be forwarded to the sub-commitee chairman.

*

It's the Long Pull

ON May 10, the steel masters of the United States gathered for the twenty-seventh annual meeting of the American Iron and Steel Institute. Mr. Schwab, in the principal address, emphasized that the uncovering of new uses for steel had provided a diversification of demand which serves to protect the industry against fluctuations in general business conditions; new specifications from new sources tend to offset lowered demands from others. The present record of the industry would appear to prove his contention. Though the railroads and the automotive builders continue to be the biggest customers for steel, forty per cent of steel output already goes to other users—a significant condition surely.

With Mr. Schwab's address should be coupled that of Mr. Farrell wherein he stated, "There is nothing wrong with the steel industry. I do not know much about the financial situation and call money and other relations, but I believe they have little to do with our business. The steel industry has a good background. A little check here and there is always helpful. Business today is very good. Production of the country is not down to 79 or 80 per cent, but up to 79 and 80 per cent."

Granted that both steel masters lean toward optimistic views of the present and the future, it should be clear that they are taking the long view and the true view of the steel business and of all business as well. As sensible men, they undoubtely disregard the ecstatic Saturday nights and the blue Mondays of their personal lives. As clear-thinking business men, they discount the ecstatic boom years and the readjustment years that seem inevitably to follow. Production is not down to 79 or 80, it is up to 79 and 80. It's "the long pull and the strong pull" that must count in the long run.

*

The First Stone?

IN A recent address before the National Association of Cotton Manufacturers, Henry P. Kendall proposed ten commandments for the good of the industry. Mr. Kendall was talking to his own industry and therefore free to express frank opinions phrased in good Bibical language. All he had to say is probably Gospel truth, but what other industry will rise up and cast the first stone?

Among the improvements urged by Mr. Kendall were: the seeking of understanding of the basic ills of the industry; the facing of issues; the abandonment of the long-hour, low-wage tradition; the maintenance of earnings; the "exaltation" of good management and the welcoming of new blood; competition in creativeness rather than on price; integration of functions; the practice of teamwork; the spending of money to build up good will.

There are industries proficient in some of these desirable attributes, but are there any that can claim proficiency in all of them? If there are none then Mr. Kendall's admonitions to the textile men should be taken to heart by their contemporaries in other industries. Until such time as perfection is in sight it will not be wise to look about for that first stone to cast at the textile men.

SHOP EQUIPMENT NEWS

Buffalo No. 15 Billet Shear

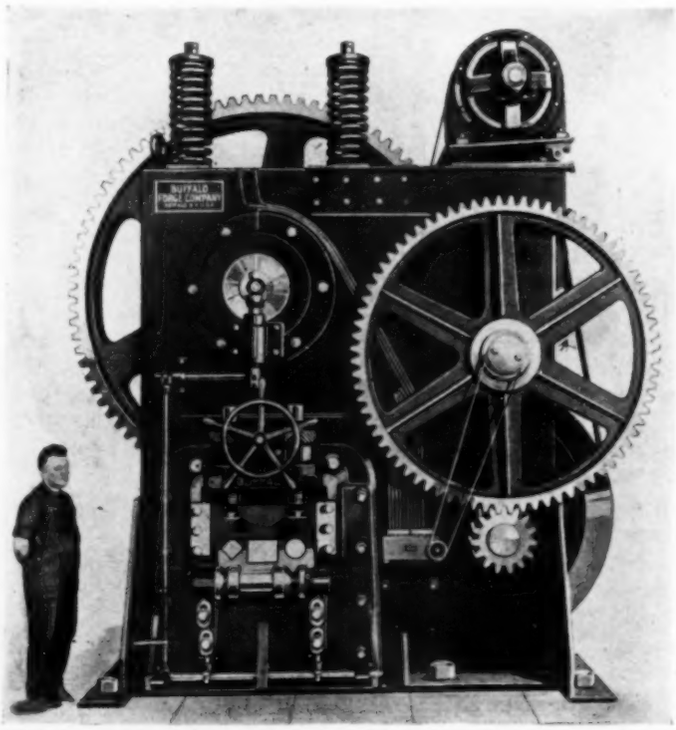
CAPACITY for cuts on 7-in. square or 7¾-in. round bars of .150 carbon steel is found in the No. 15 billet shear furnished to an automobile manufacturer by the Buffalo Forge Company, Buffalo, N. Y. This machine is one of the twelve sizes built by the concern in capacities ranging from 1- to 8¾-in. bars.

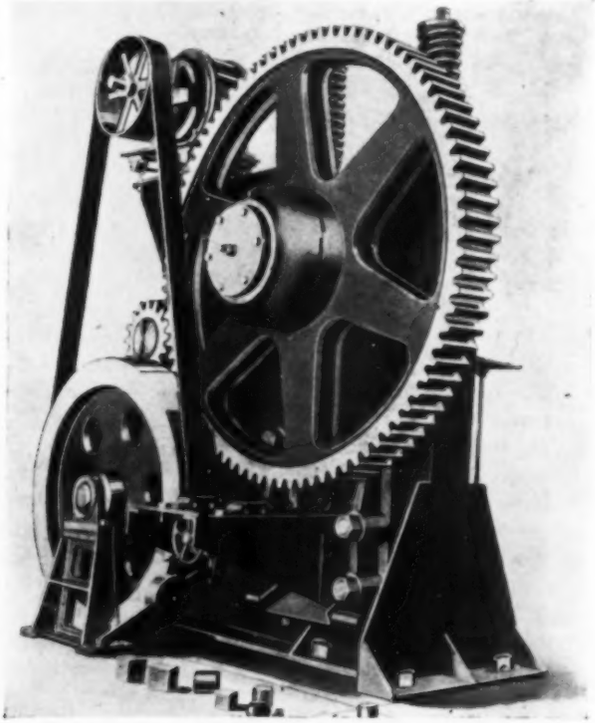
An innovation in the construction of heavy armor plate billet shears is shown in the accompanying illustrations. The high-carbon steel plates are joined together by arc welding heavy bars between them, thus forming a unit of greater strength than where studs are employed. These bars run the full length of the frames on either side of the plunger, and are welded along all four edges. The welded sections are in tension only. This is accomplished by running heavy alloy steel studs through both frames and stifferners in the rear. These studs pass through slits in the plunger near the knives to overcome any tendency of the frames to spread. In addition to welding the frame, heavy disks are welded to the rear frame, which is lighter than the front frame, at the points where the main and intermediate bearings are located. The knifeholder, which is a steel casting and in one piece with the stripper holder, is also welded to the frame as well as the brackets.

An alloy steel casting is employed for the ram, the ends of which engage the plunger in a hardened tool steel seat, the end being heat-treated for maximum wear. The plunger is counterbalanced and adjustable by two gibs, one on either side to facilitate centering of the knives. The reaction due to shearing is taken up by two bronze guides behind the plunger. The knife-seats in the plunger, front frame, and knifeholder are lined with hardened tool steel pieces of an area considerably in excess of that of the knives, to prevent the pounding down of the seats.

Six splines at the end of the eccentric transmit power from the main gear clutch, there being no inserted keyways. The clutch and gear jaws are faced with interchangeable hardened tool steel pieces and thrust is taken care of by an adjustable bronze washer. Both the intermediate and oilring bearings are inserted in the frame, and not mounted in separate overhung, cast-iron housings. The outboard bearing is of the self-aligning roller type.

Forced-feed oiling takes care of every bearing, as well as the slide and other moving parts. The machine may be tripped by hand or foot, or locked to operate continuously. Attention is called to the stripper reaching close to the knives to allow using up the material without undue waste. Also provided is an adjustable guide roller, and the machine may be equipped with a tilting gage. As a safety feature for accidental overload, a



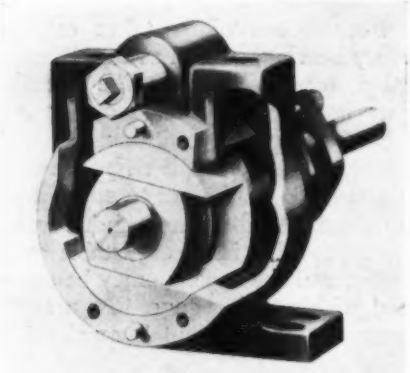


In the Buffalo No. 15 Billet Shear, bars running the full length of the frame on either side of the plunger are welded along all four edges to stiffen the high-carbon steel plate frame

shearing pin is provided in the flywheel hub, the wheel itself being bronze bushed to prevent its freezing to the shaft.

"Rotapiston" Pump

Only four parts are used in the "Rotapiston" pump placed on the market by the Globe Products Company, Cleveland, Ohio. These moving parts are the cam-shaft, two pistons, and the revolving rotor in which they oscillate. No springs nor suction and discharge valves are required. The pump is therefore as simple as an ordinary rotary pump, but combines the high suction lift and discharge



Available in ¼, 1, and 2 gal. capacities, the "Rotapiston" pump has only four moving parts

characteristic of the piston type, with the compactness of the rotary type. For this reason, and because it requires no priming, it is particularly adapted to uses where instant action and general reliability are essential. Among these uses may be mentioned the circulation of cutting oil for machine tools and forced lubrication of machine bearings.

The present three sizes are manufactured in the following sizes: ½ gal., 1 gal. and 2 gal. per minute for each 100 revolutions of the drive shaft.

The camshaft is placed slightly off-center with the rotor, and the revolution of the cam causes the two pistons to move back and forth in the rotor. Since the camshaft is off-center, however, and since the center line of the camshaft must necessarily coincide with the center line of the piston, the rotor revolves so as to present each face of the pistons to the discharge and suction ports in succession. The camshaft revolves at twice the speed of the rotor, thus enabling a high-speed and therefore less expensive motor to be used while still keeping the speed of the pump at a slower and more desirable rate.

It is claimed that a suction lift of 18 ft. has been obtained. To assure noiseless operation and steady full-bore discharge, the pistons are at right angles to each other, and since each piston is discharging at one end while it is creating suction at the other, there are four discharge and four suction strokes to each revolution of the rotor.

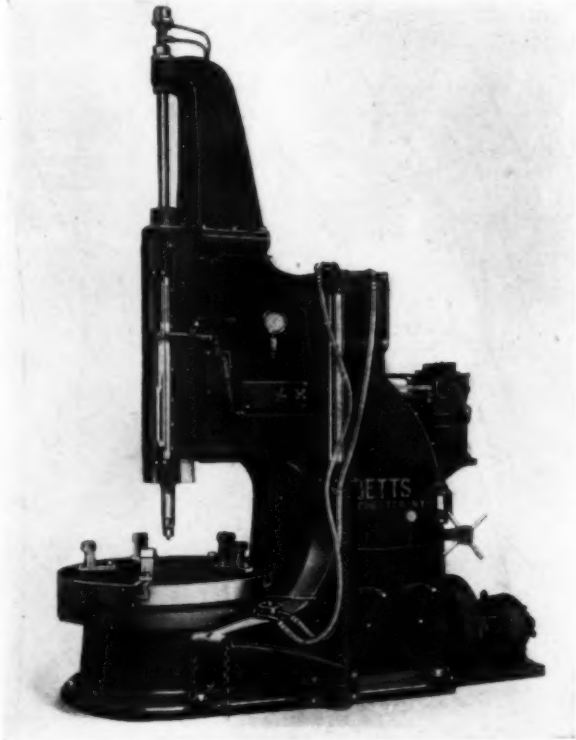
The "Rotapiston" pump is normally set for clockwise rotation, but the direction can be readily reversed by merely changing the position of the relief valve. Three models of this pump are available, that is Nos. 1, 2 and 3, having pipe connections of ⅜, ¾ and 1 in., respectively.

Betts Heavy-Duty, Oilgear-Feed Car-Wheel Borer

APPLICATION of Oilgear feed to the Betts heavy-duty, car-wheel borer has been announced by the Consolidated Machine Tool Corporation of America, Rochester, N. Y. The entire operation of the feeds and rapid traverse is controlled by oil pressure, permitting heavier feeds and faster production, and at the same time eliminating feed gearing. Further, by the use of this feed the entire cycle of boring operations is automatic, requiring no attention from the operator, so that he merely has to start the machine and then is free to do other work while the car wheel is being machined automatically.

Placing the car wheel on the table is effected by means of a hoist furnished with the machine. This hoist may be either mechanically or air operated, and may be either of the single or double type. As the machine is started, the wheel is chucked automatically. The boring bar, on which are the roughing cutter, the finishing cutter, and the chamfering cutter, descends quickly by rapid traverse as soon as the feed lever is thrown in. As the roughing cutter reaches the work, its speed is cut down automatically to exactly the proper feed for rough boring. When the rough boring is completed, the rate of feed changes so that the finishing cutter enters the work automatically at the proper finishing feed. After the finishing cut is completed, the edge is automatically chamfered by the chamfering cutter, and the boring bar returns automatically by quick rapid traverse to its original position.

Four feeds are provided for the



Correct roughing and finishing feeds are obtained automatically from the Oilgear apparatus on the Betts Heavy-Duty Car Wheel Borer

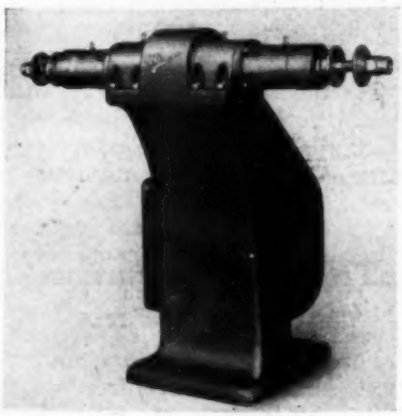
table, these being obtained by means of hardened steel gears running in oil. The feed rate can be changed instantly under cut by the operator, if desired. The machine can also be stopped at any point in the work. When desired, a hub facing head may be applied to the machine and also provided with Oilgear feed.

Hisey Model M TexDrive Buffer and Polisher

Gooseneck design of the stand has been employed in the "Hisey" TexDrive buffer announced by the Hisey-Wolf Machine Company, Cincinnati, Ohio. The spindle and buffing wheels extend out from the base of the machine, permitting easy handling of large and odd-shaped pieces. This feature enables the operator to stand close to the machine or sit comfortably at it where the nature of the work permits him to do so.

The motor mounting is of the external type with a rigid, four-point support. The motor is of ball-bearing design and equipped with a dovetailed sliding base, including a gib with the necessary locking screws. Adjustment is effected by means of a handwheel and a feed-screw.

Different spindle speeds can be secured easily and quickly by merely changing the motor pulley. The design of the machine makes it possible to change the belt without pulling the spindle through the bearing housings. By loosening the four bolts on each side, the entire spindle assembly may be removed from the machine. The lubrication chambers are filled through conveniently located cups.



Large or odd-shaped parts can be handled comfortably at "Hisey" TexDrive Model M Buffer and Polisher

Reinecker Automatic Indexing Hob and Tool Grinder

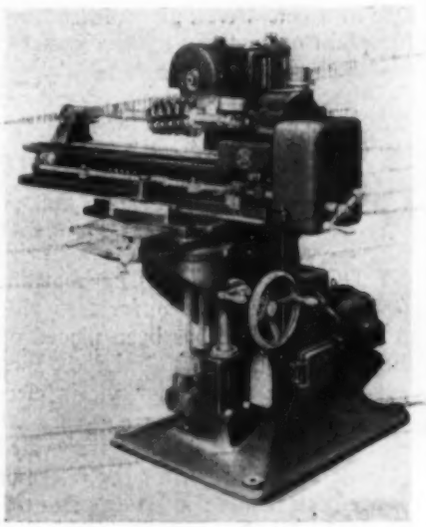
AUTOMATIC operation is the principal advantage of the Reinecker hob and tool grinder introduced into the United States by the George Scherr Company, Inc., 142 Liberty St., New York, N. Y. This machine is made by Reinecker, at Chemnitz, Germany. Table travel is automatically reciprocated, with backlash compensated for, and work is automatically indexed from flute to flute or tooth to tooth. In the case of hobs and relieved milling cutters, this automatic feature insures uniform height and length of teeth, whereas in the case of relieved hobs or formed cutters, it insures all cutting edges being ground radially to the center, which is essential to avoid distortion of profile.

In the standard form, the Reinecker hob and tool grinder is supplied for motor drive, but on option it can be had with a single pulley for drive from a countershaft. The motor is mounted on an extension of the base, and is direct-connected to the main driving shaft inside the column. Two speeds are provided for both the grinding wheel spindle and the automatic table travel. The latter is adjusted by two stops. Both wheel and table speeds are changed by means of conveniently located levers.

All adjustments of the indexing mechanism for the number of teeth and for the spiral lead are obtained with change gears selected from tables furnished with each machine. More accurate results are obtained by this manner of indexing than would be the case if worn hobs and tools were employed.

The automatic dividing head casting is made of aluminum alloy, and this greatly reduces the weight of the overhang and correspondingly increases the load capacity of the machine.

For taper grinding, the table top turns and is set according to the accurate scale provided. The cross slide also turns up to 45 deg., and a circular scale is provided for setting its position. Vertical and horizontal adjustments are made by means of a crank with a screw and dial.



Automatic indexing from flute to flute or tooth to tooth is a feature of the Reinecker Automatic Hob and Tool Grinder, which is built in two sizes

The wheelhead can be turned completely around, a feature which increases the scope and range of the machine. This is of importance in

Specifications of the Reinecker Automatic Hob and Tool Grinder

	NWS No. 1	NWS No. 2
Largest grinding length with automatic dividing head, in.	25½	29½
Largest distance between centers of tailstocks, in.	28	31½
Maximum diameter, in.	8	16
Maximum distance between center of spindle and table surface, in.	12½	16
Table top swivels up to, deg.	5	5
Table cross-slide swivels up to, deg.	45	45
R.p.m. of wheel spindle	2,150 and 3,000	1,700 and 2,340
Maximum length and diameter for cylindrical grinding, in.	20x4¾	27½x7
Hp. required	3	5
Approximate net weight, lb.	2,100	3,550

the grinding of multiple-thread hobs with a steep lead. Correct shape of the grinding wheel is maintained by a diamond dressing device incorporated in the wheelhead. When specially ordered, the machine can be equipped with either cylindrical or internal grinding attachments, or both.

The Reinecker hob and tool grinder is built in two sizes, providing a range that will take care of most ordinary tool grinding requirements.

Standard equipment includes the following items: Arrangement for motor drive, or countershaft in the case of a belt-driven machine; fixture for plain or angular milling cutters; two massive tailstocks with centers; one guide finger with base and tension roller; two hand rests on the rear of the spindle for grinding simple tools by hand; one cup wheel and two plain wheels, and gear guards, wrenches, and spanners. Besides the cylindrical and internal grinding attachment mentioned previously, the extra attachments include: an attachment for grinding taper tools and angular milling cutters; an attachment for wet grinding including pump and tank; a dust exhaust for dry grinding; a hand operated dividing head instead of an automatic one, and an attachment for face mill cutters.

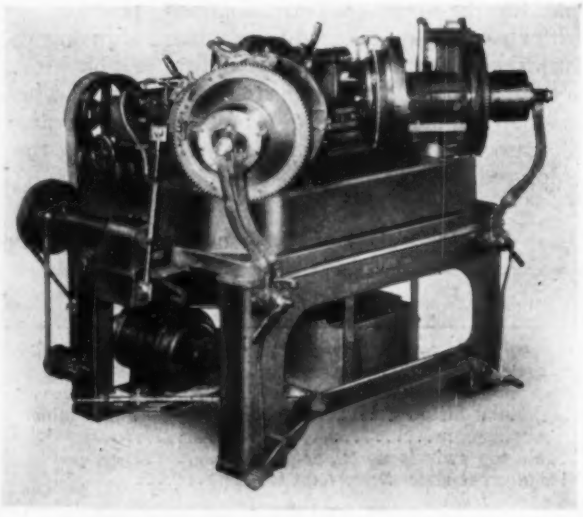
Lipe Flywheel Ring Gear Chamfering Machine

A DOUBLE-SPINDLE machine designed to chamfer two ring gears at one time has been placed on the market by W. C. Lipe, Inc., Syracuse, N. Y. This unit is electrically driven, and the ring gears are held in place by air chucks operated by foot levers to permit the operator to use both hands for loading and unloading. The average loading and unloading time is 12 seconds.

A master indexing ring is used for indexing, thereby insuring accurate chamfering of each tooth. An internal form ground hollow mill is used for the chamfering operation. Long cutter life is obtained through the heavy flow of cutting lubricant and heavy sturdy design of the cutter.

The machine will chamfer ring gears at the rate of 80 teeth per minute on each spindle. One operator can handle two machines placed front to front, which will give a production of approximately 152, 110-tooth ring gears per hour.

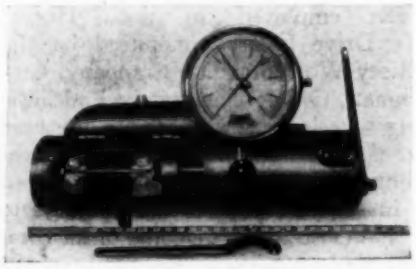
The machine is equipped with two 1-hp., 1,200-r.p.m. motors, making it possible to run one spindle at a time. The over-all floor space required is 61½x44 in., and the total height is 50¾ in. The distance from the center of the work spindle to the floor is 39¾ in. The net weight, including the motors, is 3,080 pounds.



Up to 80 teeth per minute can be chamfered per spindle on this double-spindle Lipe Flywheel Ring Gear Chamfering Machine

Oxweld Portable Testing Machine

An accurate, reliable, inexpensive machine for routine testing in small laboratories and plants where the investment in a large universal machine would be unwarranted has been placed on the market by the Southwark Foundry & Machine Company, Philadelphia, Pa. This machine is known as the "Oxweld" portable testing machine, and has been developed in collaboration with the Union Carbide & Carbon Research Laboratories, but is built by the former concern. It is a self-contained unit and when closed for shipment there are no projections, the unit presenting a smooth cylindrical surface. The dial is removed and shipped in its separate case and the pump handle is placed inside the machine and the cover closed and locked. It is claimed that the unit will stand comparatively rough handling.



Specimen under test in the small Oxweld Portable Testing Machine, which has capacity for loads up to 40,000 pounds

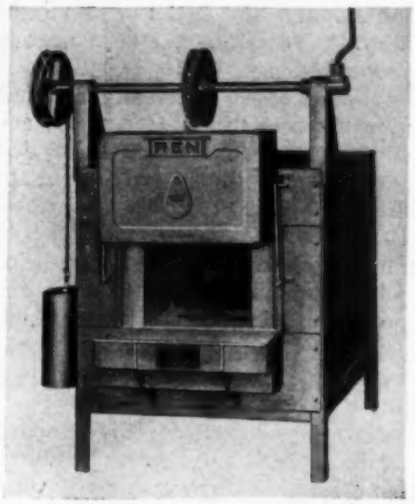
A hand-operated piston-type pump is located in the end of the cylinder. The total load is indicated directly on an Emery dial with 8½-in. face, with zero adjustment and a maximum hand. Each dial is hand-calibrated and the accuracy is to within 1½ to 3½ per cent.

The wedge grips are manipulated by the fingers. The maximum diameter of the device is 6¾ in., and the over-all length is 28 in., the stroke being 7 in. The weight is 165 lb., and the capacity is for loads up to 40,000 pounds.

The machine may be furnished in special form for 8 in. gage-length specimens, and also as a compression machine for making bend tests on welds.

Trent Electric Furnaces for Small Parts

For the shop, laboratory, or technical school with heat-treating requirements that do not warrant the purchase of furnaces of the heavy-duty type, the Harold E. Trent Com-



Trent Electric Furnace for small parts in shops where the production requirements are small

pany, Philadelphia, Pa., has developed a line of small furnaces of which the main difference between them and the larger types is in lighter mechanical construction. However, their thermal efficiency is comparable to that of larger models.

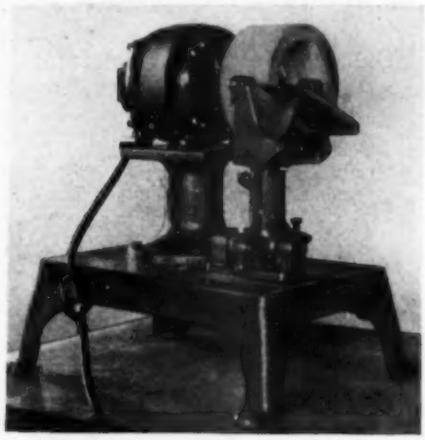
Simple design is one of the features of these furnaces. Attention is directed to the method of drawing the door tight against the furnace fronts. A pin on the door casting engages a bar that slopes in toward the furnace front about half-way down from the opening. The doors are counterbalanced so that they may be operated by one hand by a lever not over 1 ft. long. Heating elements of the strip type continuously folded and formed are employed, and are said to give long service because of the absence of sharp points or corners.

At 1,850 deg. F., the 8 x 6 x 12-in. size uses 4.5 kw. at 110 volts on three-phase, 220 volts, single-phase.

Wells Sharpener for Metal Pattern Scrapers

Scrapers employed for use on metal patterns may be sharpened on the machine illustrated, which has just been announced by the Wells Manufacturing Company, P. O. Box 613, Greenfield, Mass. In addition, this machine will grind all kinds of wood workers' chisels, plane irons, and wood scrapers to the correct angles for efficient work. It will grind flat scrapers for machinists to the correct shape with a free cutting wheel, which will not heat nor draw the temper of the tool.

The machine is simple to operate. The work is laid on the flat supporting plate and held by hand. This plate is rocked past the wheel, swinging on pivots, which are protected from dust to prevent wear. The supporting plate will hold any chisel or scraper up to 3⅝ in. wide, and can be adjusted

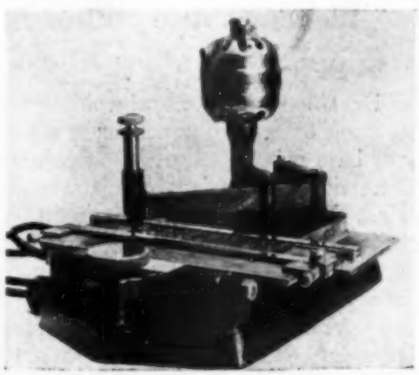


Scrapers up to 3⅝ in. wide can be sharpened at any angle on this Wells Sharpening Machine

for any angle of cutting edge. The cup wheel is mounted directly on the motor, which is of ⅙ hp., operating on 110 or 220 volts.

"Simplex" Engraving Machine

For the marking of flat gages, name plates, and the engraving of serial numbers on panels made of soft steel, brass, aluminum, hard rubber, or Bakelite, the Simplex Tool Company, Woonsocket, R. I., has developed an engraving machine which will take pieces up to 14 in. in height and of any width by ⅞ in. in thickness. Practically no set-up is required in the operation of this machine as the work is inserted and held by simply loosening the large headed screw shown at the front part and then lifting up at the back the upper part of the machine which hinges at the front. The work is set between this hinged part and the base and clamped in place by tightening this screw.



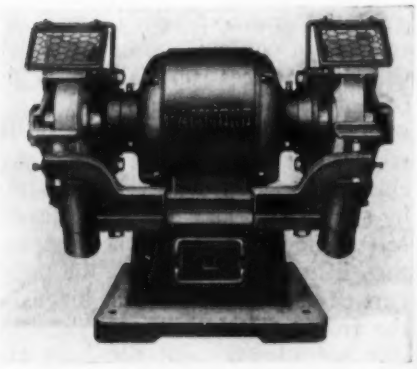
Soft steel, brass, aluminum, hard rubber, and Bakelite may be marked or engraved on the "Simplex" Engraving Machine

Engraving is done by means of a pantograph, individual letters being set upon the table of the machine to form words engraved by the cutter attached to the motor. The engraved letters are approximately one-third the size of the master letters on the table. The tracing point moves in and out of its socket as pressure is applied or released by hand in tracing. A spring in back of the tracer raises the tracing arm and keeps the cutter away from the work when the hand pressure is removed. The space engraved at one time is approximately 3 x 1 inch.

Hammond Type W Bench-Type Electric Grinder

The Type W bench-type electric grinder manufactured by the Hammond Machinery Builders, Kalamazoo, Mich., is suitable for general purpose work and for use as a light production grinder. It is made in 1½ and 2 hp. capacities, the motor being totally inclosed and specially designed for grinder service. Push-button control is conveniently mounted on the pedestal with a Cutler-Hammer automatic motor starter inside. This protects the motor from overload, low voltage, and phase failure.

The chrome-nickel steel shaft floats on over-size ball bearings protected by means of double labyrinth seals, and convenient oil cups, oil-level gages, and flushing plugs are regularly supplied. Standard equipment also includes universal adjustable steel wheel guards, which can be adjusted to compensate for the wear of the wheels. The exhaust outlets furnished as part of these guards are for convenience in attaching to exhaust



Hammond Type W Bench-Type Electric Grinder, which is suitable for general purpose work and light production operations

systems. Shatterless glass eye shields offer protection and convenience to the operator.

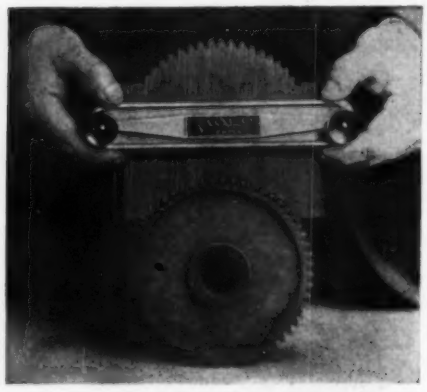
The single-phase machine is supplied with a condensor-type motor, having the same general characteristics as that of a power line motor, but capable of starting under heavy load and withstanding excessive overload. It has a solid rotor and there are no commutators nor centrifugal switches to give trouble.

These machines are furnished for 110-, 220-, 440- and 550-volt, 1-, 2- or 3-phase, a.c. circuits, and for 110- and 220-volt d.c. service. They are supplied in both the bench and floor types, the 1½-hp. machine taking grinding wheels 10 in. in diameter by 1½ in. face and the 2-hp. unit, 12 x 2-in. wheels.

"Maco" Adjustable Template

Difficult contours may be taken exactly in a few moments by means of the "Maco" adjustable template marketed by the American Maco Template Company, 44 Whitehall St., New York, N. Y. In the checking of parts for wear, such as locomotive driving wheels, crankpins, journals, and other parts, the device is a ready means of determining whether or not a dangerous limit has been reached, and the profile of the instrument may be traced on the record sheet for filing purposes. Castings may be tested for warpage, and the progress of die-sinking may be observed, particularly to get the upper and lower die impressions the same for symmetrical parts. In the replacement of broken parts, the device can be of aid in determining the section at various points and thus simplify repairs.

The template is composed of a number of very fine strips of hard-drawn brass, the thickness of each being 0.007 in. These laminations are held in position in the aluminum frame by two clamps and will not fall



Showing how the laminations in the "Maco" Adjustable Template assume a difficult contour

out because of corrugated strips of rubber bearing against them.

When taking a contour, the screws are loosened and the edge of the device is pressed gently against the work, with the result that the laminations take a perfect contour of the surface against which they are pressed. The thinness of the laminations assist in the process. After they have assumed the contour exactly, they are locked in place by means of the screws, and in this position can be used for checking purposes against other parts or a master. If desired, a recorder frame may be obtained for sketching purposes.

Westinghouse "Phos-Copper" Welding Alloys

Developed as a general welding and brazing material for copper and copper-base alloys, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is marketing its "Phos-Copper" welding alloys. These are made in rod and strip form and are composed essentially of copper and from 5 to 10 per cent of phosphorus, the rod form containing slightly more phosphorus than the strip form. The fluidity of the material is directly proportional to the phosphorus content, and the higher the fluidity, the better will be the alloying, penetrating, and cementing properties.

"Phos-Copper" alloys begin to melt at approximately 1,292 deg. F., and become extremely fluid at 1,382 deg. F., for the rod, and 1,472 deg. F. for the strip. The presence of the phosphorus prevents the oxidation of both the copper and the surfaces being joined, thereby acting as a flux and producing a sound and dependable joint. The phosphorus partially burns out, leaving a uniform composition of the joint.

The alloy in rod form is comparatively brittle at ordinary temperatures, but a chemical change takes place during the welding process, making the deposit in the joint strong, tough, and ductile. The strip form alloy is soft and sufficiently ductile to be slit to any desired width or length, and will form punchings down to a radius of 0.064 in. The latter is often desirable wherever pipe and coil connections can be made by using Phos-Copper punchings of the proper diameter.

The tensile strength of the deposit or joint varies from 18,000 to 30,000 lb. per sq.in., and is greater than that of copper, but the ductility is less.

The application of alloys will vary, of course, with the materials to be brazed, and with the method of brazing; that is, acetylene torch, carbon arc, or incandescent carbons. In general, however, the practice is as follows:

1. Clean and free from grease all members to be joined. Acid dipping is recommended.

2. Place strip of Phos-Copper, a little larger than the surface to be joined, in the joint.

3. The joint material is heated to about 1,475 to 1,500 deg. F., or until the Phos-Copper is well fused.

In cases where a strip of the material cannot be inserted in the joint, the torch or arc flame should be directed against the joint surfaces until they are fully heated to about 1,475 deg. F., and at that point a tip of Phos-Copper rod is applied to the weld as a filler rod. It is important that the proper temperature be reached, because poor amalgamation results if the material is added before that temperature is attained. With incandescent carbons, the strip form of Phos-Copper alloys is applied externally to the joint.

NEWS
OF THE WEEK

President Hoover Made Honorary Member of Management Association

PRESIDENT HOOVER was announced as an honorary member of the American Management Association at the International Dinner on Tuesday evening, May 13, held in connection with the Annual Spring Convention of the association at the Hotel Astor in New York City. Charles De Freminville of Paris was also announced as an honorary member.

Charles De Freminville

Herbert Hoover

Among the speakers at the dinner were Lucius R. Eastman, J. L. Merrill, F. C. Page, and Henry S. Dennison, as well as the representatives of a number of foreign governments.

That the mergers, which are so prevalent today, are detrimental to the effectiveness of the important men in the merged companies and that drastic steps must be taken to overcome this disadvantage, was brought out by J. P. Jordan in one of the addresses on Tuesday afternoon. Mr. Jordan took the position that as companies increase in size, either through natural growth, absorbing other companies, or being absorbed by other companies, the men who were "big fishes in little puddles" become "little fishes in little puddles" with the result that they lose the sense of responsibility originally felt. They become, therefore, less efficient.

Col. H. A. Toulmin, Jr., speaking also on the subject of mergers said "An organization large enough to be a merger has undertaken a public trust. Its success is in proportion to its service rendered. This is not altruistic but it is essential to good business. A merger that is put together for the purpose of monopolizing a trade by excluding outside competition and thus of wrecking competitors; a merger that has for its primary purpose price control; a merger that has for its purpose the reduction of employment and the wholesale discarding of executive personnel, as well as the rank and file; a merger that expects to effect economies through the elimination of advertising and research because of its monopoly of its field at the time the merger is made, will be a merger that is doomed to failure. Such conduct is destructive."

Col. M. C. Rorty, speaking on the Organization of the Managing Group on Monday afternoon, said "A distinctly 'new era' in business today is found in the fact that many great corporations do not attempt to improve operating results through reductions in wages. Current wage levels are accepted as a matter of course, with the expectation that they will tend to rise rather than fall. This point of view is founded, not upon the shifting sands of sentimentalism, but upon the solid rock of enlightened self-interest." Colonel Rorty cited managerial ignorance rather than evil intent as the basis for many, if not most, of industrial troubles, the cure being broader training of executives.

At the directors' meeting held at the Hotel Astor on May 13, the following officers were elected for the ensuing year:

Chairman of the board, Samuel A. Lewisohn, Adolph Lewisohn & Sons.
President, William J. Graham, Vice-president, The Equitable Life Assurance Society of the United States.
Vice-president, in charge of Program & Publications, Arthur H. Young, Industrial Relations Counselors.
Vice-president, in charge of Industrial Marketing Division, C. R. Cary, Vice-president, Leeds & Northrup Company.
Vice-president, in charge of Consumers Marketing Division, Irwin D. Wolf, Secretary, Kaufman Department Stores, Inc.
Vice-president, in charge of Production Division, Thomas B. Jones, Vice-president and general manager, Harris-Seybold-Potter Co.
Vice-president in charge of Financial Division, John C. Orcutt, Vice-president, Irving Trust Company.
Vice-president, in Charge of Office Management Division, Cooke Lewis, Vice-president and comptroller, Liberty Mutual Insurance Co.
Vice-president, in charge of Insurance Division, P. D. Betterley, Assistant-treasurer, Graton & Knight Company.
Vice-president, in charge of Personnel Division, Harvey Ellerd, Personnel department, Armour & Company.
Vice-president, in charge Shop Methods Division, P. L. Dildine, Engineer in charge of time study, standards, and budgets, B. F. Goodrich Company.
Vice-president at Large, Ernest G. Draper, Vice-president, The Hills Brothers Company.
Vice-president and treasurer, Harry C. Gilmore, Secretary, Western Electric Company.

The Board of Directors has created an Insurance Division, the purpose of which will be to discuss insurance primarily from the buyers point of view as a means of protecting the company against business risks.

A Shop Methods Division was also created to deal with the general field of industrial engineering.

* * *

Steel Founders Express Optimism

A general meeting of the Steel Founders' Society of America, Inc., held in conjunction with the convention and exhibition of the American Foundrymen's Association at Cleveland, Ohio, on May 14, brought forth some of the most favorable comment that has been heard on business and general business conditions so far this year. The sentiment of executives present from steel foundries all over the country indicated they were confident that the second quarter of this year would show some improvement over the first quarter and that in the last half of the year some real good business would materialize.

Operations, as reported by members of the Society, are running approximately 76 per cent of capacity; shipments, 79 per cent of capacity; bookings, 76 per cent of capacity. Inquiries are holding steady. Labor conditions are good with a surplus in the Middle West. The general business outlook is fair.

John E. McCauley, of the Birdsboro Steel Foundry & Machine Co., president of the Society, was optimistic over the future outlook for the branch of the steel industry comprising steel foundry operations and practice.

Europe's Machine Imports Increase 25 Per Cent—More Competition in Canada

By Paul Wooton
Washington Correspondent

WASHINGTON, D. C., May 21—That American metal-working machinery is successfully invading the home markets of its chief competitors is revealed in a report just compiled by S. R. March of the Commerce Department's Industrial Machinery Division. Outside of the United States, the world's leading producers of metal-working machinery are in Europe, so it is of notable significance that American shipments of items under this class last year, amounting to $25,200,000, represented an increase of nearly 25 per cent over 1928 and 73 per cent over 1927.

European industrial conditions in general, in 1929, were the best that have been experienced since the War. The United Kingdom and France increased their metal-working machinery purchases to $8,282,000 and $6,367,000, which were record levels. Shipments to the United Kingdom showed a 30 per cent gain over the previous peak year 1928, and were more than double the volume of 1925. Although France can readily secure machinery from Germany on reparations account, it is noteworthy that shipments of American metal-working machinery to that country in 1929 were the greatest in recent trade history and exceeded the large trade of 1928 by more than 35 per cent.

Trade with Soviet Russia has in recent years been unusually expanded owing to the extensive industrial program of that country, and more recently to the Soviet five-year industrial plan which became effective with the fiscal year 1928-29. In both 1927 and 1928 the purchases of Soviet Russian in Europe have exceeded the $1,000,000 mark, and in 1929 they jumped to $2,620,000, putting Russia considerably ahead of Germany as a market outlet for that year. Whether continued increased business may be expected from this quarter cannot safely be predicted, owing to the abnormal conditions.

Not only have American shipments to Europe shown marked increases but the proportion of metal-working machinery exports destined for this area has steadily advanced, rising from 51 per cent in 1926, to 58 per cent in 1927, to 60 per cent in 1928 and to 62 per cent in 1929.

The total value of United States exports of metal-working machinery in 1929 was $40,800,000, a figure 18 per cent greater than that of 1928, 60 per cent above that of 1927, and larger than for any period since the abnormal post-war year 1920. Canada was the chief individual market, having displaced the United Kingdom in 1928. Last year, Canadian shipments, including those to Newfoundland and Labrador, reached a value of $8,400,000 and represented more than 20 per cent of total U. S. shipments. This trade with Canada was more than three and a half times that of 1926 and 20 per cent above that of 1928.

The accompanying table compares the principal foreign markets for American metal-working machinery during the years 1925-1929, inclusive, the various marketing being listed in the order of their importance in 1929.

Table I—Principal Foreign Markets for American Metal-Working Machinery

	1925	1926	1927	1928	1929
Canada	$2,328,409	$3,214,770	$4,626,481	$6,937,761	$8,374 795
United Kingdom	4,053,267	4,654,007	5,721,064	6,345,090	8,282,078
France	2,429,269	1,581,929	2,198,424	4,690,227	6,367,240
Soviet Russia in Europe	887,923	537,931	1,046,465	1,193,388	2,619,658
Germany	2,986,434	1,017,824	3,175,313	2,615,427	2,134,327
Japan	1,204,733	874,491	1,238,320	1,424,664	1,686,238
Italy	1,724,504	515,165	598,786	876,730	1,497,190
Sweden	301,862	329,776	386,037	535,847	1,120,477
Belgium	183,792	266,408	291,183	947,494	762,511
Czechoslovakia	256,832	107,127	156,425	801,761	658,439
Netherlands	365,103	109,981	296,789	460,377	625,550
Mexico	557,106	637,964	335,760	540,895	603,688
Australia	840,796	918,395	939,858	669,279	580,896
Argentina	324,803	252,148	406,865	524,694	547,993
Brazil	299,458	383,243	567,543	649,160	463 981
Spain	323,135	228,633	361,801	307,975	453,061
British India	361,576	460,951	396,905	310,102	444,899
Chile	485,160	418,926	209,907	206,274	427,179
Netherlands East Indies	85,374	95,918	123,667	245,880	375,076
British South Africa	268,791	323,506	288,668	317,604	349,900
Switzerland	66,482	107,822	157,069	136,469	233 230
Venezuela	127,564	177,699	246,418	164,152	158,804
Cuba	309,160	209,386	201,477	132,503	157,755
Philippine Islands	53,309	72,846	114,302	123,033	140,155
China	46,055	61,900	42,131	48,584	124,771
Peru	81,718	202,189	133,960	120,844	123,195
Colombia	243,818	139,485	218,055	136,579	105,996
New Zealand	87,510	240,733	155,855	118,483	95,259
Denmark	21,634	28,708	43,281	80,767	88,315
Panama	70,056	33,593	42,412	100,527	87,996
Poland and Danzig	20,144	42,086	36,683	76,876	87,114
Norway	45,838	30,388	39,010	83,742	83,719
Bolivia	19,991	21,840	20,519	73,480	73,580
Irish Free State	(1)	(1)	(1)	1,159,893	69,958
Uruguay	27,576	15,356	13,553	36,872	57,793
Netherlands West Indies	(1)	(1)	(1)	123,569	55,512
Finland	(1)	(1)	(1)	67,857	52,891
British Malaya	20,701	22,728	20,715	39,813	52,837
Soviet Russia in Asia	(1)	(1)	(1)	150,177	51,963
TOTAL, including other countries	$22,036,796	$18,867,522	$25,379,417	$34,124,809	$40,803,393

(1) Included in "other countries."

Greater competition from the United Kingdom may be expected as a result of Canada's new tariff on machinery which became effective on May 2. Although the rates generally appear to be lower, thus evidencing the Dominion's intention to relax this handicap on her industrial development, some rates have been raised and the preference in favor of British goods increased. As a large proportion of the machinery imported into Canada is unclassified the most important changes in the machinery schedule are in the basket items. Heretofore, such machinery, engines and boilers, and manufactures of iron and steel have been dutiable at 15 per cent, 25 per cent and 27½ per cent under the British preferential, intermediate and general tariffs respectively. While the general rate to which imports from the United States are subject has been reduced from 27½ per cent to 20 per cent on machinery of a kind not made in Canada, the British preferential rate has been reduced from 15 per cent to zero, thus increasing the differential against American machinery from 12½ to 20 per cent. On machinery of a kind not made in Canada the general rate has been increased from 27½ per cent to 30 per cent while the British preferential rate remains the same at 15 per cent. The same holds true of electrical apparatus, engines and boilers, and iron and steel manufactures not otherwise provided for in the tariff. It is expected that administrative difficulties will arise in connection with these basket items because of the distinction made between machinery of a kind not made in Canada and of a class or kind made in Canada.

THE program of the Twenty-Third National Conference on Weights and Measures, to be held in Washington from June 3-6, promises to be fully up to former standards as to the importance and variety of the items. The following outline of accepted assignments will serve to illustrate the constructive character of the matters to be considered.

The Assistant Secretary of Commerce, Hon. Julius Klein, will address the Conference at its third session, on June 4, while the program of the opening session on June 3, will follow those of former meetings, with an address by the president of the conference, Dr. George K. Burgess, and with the reports of State delegates and representative of State associations of weights and measures officials. At the afternoon session on Tuesday, the question of grease-measuring devices will be given further consideration; the committee on specifications and tolerances expects to recommend a minor amendment to the code adopted last year, and the recommended effective date for this code will be reconsidered in the light of present conditions.

On Wednesday morning, the committee on specifications and tolerances will present to the conference a proposed code for odometers; last year it was decided by the conference that this subject should be given consideration. The afternoon of the second day will be devoted to a tour of the laboratories of the Bureau of Standards.

The American Federation of Labor always has accorded enthusiastic support to the doctrine that high wages and prosperity go together. No matter what situation may develop there is no evidence to indicate that the Federation intends to depart from this doctrine even temporarily. If any compromising is to be done, it will evidently be up to the local union officials to do it.

Joining by Separation

Thin sections and alloys once considered unweldable are now welded by means of the atomic-hydrogen arc

Charges and counter charges over violations of the wage truce agreement declared at the President's conferences with business and labor leaders, have not invoked a statement from the American Federation of Labor as to the necessity of a wage readjustment to meet the present situation. Since recovery has been slower than was anticipated, it has been suggested that labor union officials properly might release industrial leaders from their promises not to make wage cuts.

The Cramton bill revising Patent Office rules of practice for the purpose of preventing deception of inventors by unauthorized attorneys was favorably reported to the Senate on May 7. The bill passed the House March 18. The bill declares it to be unlawful for any person to hold himself out as a patent attorney or patent agent unless he has been admitted to practice before the Patent Office. Persons admitted to practice in the future may not represent themselves as patent attorneys, patent lawyers, patent solicitors, or patent counselors unless they have been legally admitted to the practice of law. Engineers, chemists, and other scientific and technical experts will be recognized.

DURING the committee discussion of the naval appropriation bill which is pending in Congress, it was developed that the Bureau of Engineering has contracted for the services of an engineer to insure the proper expenditure of money for machine tools and to assist in making sound requests for future appropriations. This engineer will make a trip with department officials to all of the continental navy yards. If adequate funds are made available for machine tools in the near future, it is expected that the labor cost per dollar's worth of material may be reduced and at the same time machines may be obtained which will turn out more accurate work.

The present appropriation bill provides $1,500,000 for replacement of machine tools. It is the intention of the department, however, to make constant surveys of shop equipment to ascertain only those tools needing replacement so that a sum under the amount recommended this year may be found adequate in the future. Naval officials testified that the perfection of new high-speed cutting tools, which were exhibited at the National Machine Tool Exhibit at Cleveland last fall, has brought about a condition where it is advisable for the Department to make another change in design of its cutting tools.

It was explained to members of the Naval Affairs Committee that stand-by equipment is not included in the replacement program. The stand-by equipment is about 12 per cent of the total. Of the total sum of $1,500,000 allotted to the Department for tool replacement, awards have been recommended on bids to the extent of $700,000 at the present time. Only $12,000 has so far been expended so that very few new or replacement tools under this program have been received by the yards.

* * *

Little Change In Philippine Conditions

Basic economic conditions in the Philippine Islands changed but little during the first half of 1929. From July to the end of the year, however, general business activity declined largely as the result of low prices which prevailed for Philippine products. The year was active in most machinery lines, although there is no record of any large individual installations. Preliminary estimates placed the value of total imports of machinery at 18,100,000 pesos, as compared with 17,060,000 pesos in 1928. About 83 per cent of the machjnery came from the United States.

* * * *

"The American Peril" Rears Its Head— According to the French View

By Our Paris Correspondent

THE Syndicat des Industries Mecaniques de France has just given a complete framing of the principal mechanical industries of the country.

The iron and steel transforming industries, omitting the automobile industry, give employment to 800,000 workers, with an annual cash turnover estimated at $1,200,000,000. Of this figure, $160,000,000 worth was exported. These exports take second place in value among all products sent abroad, being exceeded only by textiles.

This is a complete volte-face as compared with the situation of before the war. It shows thus that French mechanical industries are a factor of the first order in the national economy. A curious comparison is shown by the fact that the wine and liquor export traffic amount only to $68,000,000, and that of agricultural products otherwise to but $60,000,000.

General exports have diminished greatly during the past three years, the excedent having fallen from 1,800,000,000 francs in 1927, to 1,400,000,000 francs in 1928, and to 440,000,000 francs in 1929. These enormous differences make one think. Meantime general imports have increased. Imports from Germany increased more than 100 per cent in 1929. Payments in kind from Germany, on reparations account, increased from 10 per cent of the total value of importations in 1928 to 21 per

cent in 1929. Germany's total exports of machinery to France in the year amounted to 78,700,000 gold marks, that of electrical goods 22,600,000 marks, and tools, cutlery, and other iron and steel manufactures 27,700,000 marks. This is a greater volume than that which Germany exports to any European country with the execption of Holland.

Economic accords or commercial treaties concluded in 1927 with Germany, in 1928 with Switzerland, and in 1929 with the Belgian-Luxembourg Union have been found to be reactive also with respect to the relation of France with other great industrial countries, largely by reason of the acceptance of the "most favored nation" clause. This has contributed in a large measure to the entry of foreign manufactured goods in constantly increasing proportions.

It is stated on this undeniable authority that the real reason for the diminishing returns as applied to the export of French manufactures has been brought about by the increasing production costs, not so much the wage scale, cost of raw materials or that of overhead operation as by the heavy fiscal charges and onerous taxation in many forms which a former generation knew not of. These charges are, in many cases, utterly absent in the operation regime of other countries.

The government budget demands have seemingly compelled this aggravated taxation. The budget of 1913 was 5,000,000,000 francs, that of 1929 was 50,000,000,000 francs, a co-efficient of 10, whereas the currency co-efficient is but 5 when the value of paper francs are put on a gold basis.

The taxation imposts on industry, taking into account incidences and new social welfare obligations, often amount to 50 or 60 times the entire taxation of before the war, whereas the budget demand, as is shown, is but ten.

There follows in the report a chapter on "the American peril," suggesting that great care must be taken by the authorities in applying remedies that results may not be worse than the maladies themselves.

The peril: It is recognized that the United States has reduced production costs to a level unknown elsewhere by the application of essentially mechanical processes and methods, encouraged in the first instance by the country's great home market. The report states that Europe cannot struggle against the possibility of its home and foreign markets being flooded by the excess of American productive resources, where many overhead charges have been sunk without trace in the first output stages. The product of the American automobile industry and that of the moving-picture industry may be cited as examples.

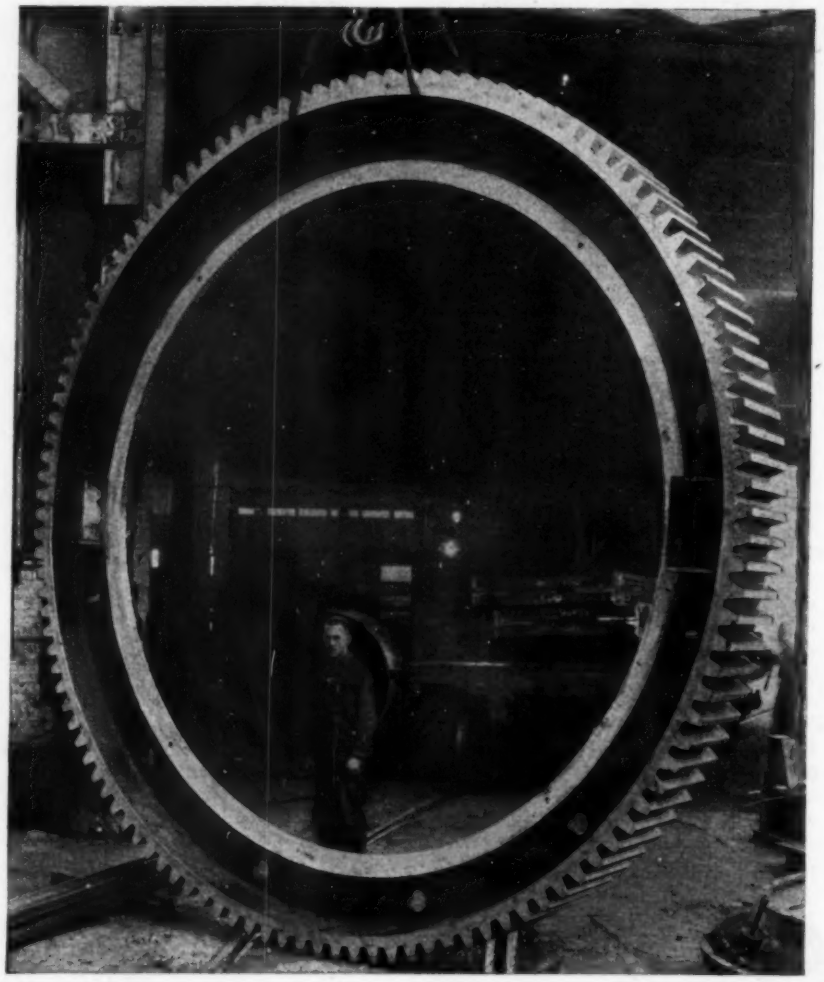
The remedies: "Worse than the malady," insists Mr. Dalbouze, president of the French Mechanical Industries Syndicate, "are such cures as suggested by the ill-fated "Tariff Holiday" which went ashore at Geneva, the lowering and finally suppression of customs barriers, and last, the United States of Europe.

Mr. Dalbouze states that it is impossible to completely suppress economic frontiers so long as political frontiers play their traditionally useful rôle in dividing distinct ethnographic and linguistic civilizations.

"Europe can never be 'Fordized,'" he continued, "without suppressing these nationalities which in many cases are demodée and incompatible with the progress of this twentieth century." He believed that a system based purely on mechanism has its limits by reason of the necessity, at one moment or another, or at one point or another in the development of processes, of human intervention as opposed to automaticity.

Mr. Dalbouze defines the American system as only applicable to *super*-mass production if it is to be wholly successful, which coupled with standardization alone can be the generator of *ultra*-low production costs.

The point of view is interesting. It sounds the note of the die-hard more than it does the real burying of the progressive idea in French industry.



Declared the Pacific Coast's largest, this 33,000 lb., steel spur gear was made in halves, the teeth being cut after it was bolted together. Its diameter is 14½ ft., and each of the 120 teeth is 19 in. wide and has a carrying capacity of 40,000 lb. It was built by the Consolidated Steel Corporation, Los Angeles

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German Industrial Situation Shows No Improvement

Abstracted from European Edition, American Machinist

ECONOMIC conditions in Germany have experienced no change for the better lately and, considering all the facts, seem to grow worse. The past Leipzig Fair did not fulfill the hopes placed in it so far as the machine industries are concerned. It is probably not too much to say that one-half of the orders in hand came from abroad. Home buying power has so far shown no improvement whatsoever. This will remain true for some time to come, since insufficient business leaves no means to purchase the new machinery that in many cases is badly needed. The problem of the unemployed tests Reich finances sorely and consequently tests those of the industries themselves. Owing to seasonal influences, the number of unemployed has decreased, but

it is still almost two millions, and in the machine and machine tool industries further labor must be dismissed. Hartmann, Chemnitz, has been forced to close down because of the want of work. Siemens & Halske, Berlin, has given notice to about 2,000 men owing to lack of work. The Steel Combine, Dusseldorf, will blow out several blast furnaces in Dortmund and Horde, by which measure some 3,000 to 4,000 men will be thrown out of employment. A number of similar examples are available.

In order to balance the budget of the Reich new taxes have been agreed upon, also higher custom duties for agricultural products, a weapon which cuts both ways. Money is easy and it is strange that only few industrialists avail themselves of the offers being made. The discount rate has dropped to 5 per cent. This is the best proof that the capital in existence does not work sufficiently, which only enhances the economic difficulties. Withholding purchases and reduction of consumption to a minimum cannot, of course, be continued for any long time; otherwise the industries that are dependent on the home market would come to a standstill.

As the economic situation abroad is, with very few exceptions, likewise unsatisfactory, and the purchasing power of foreign countries is limited, improvement by the increase of exports will likewise offer only small relief. Russia is a good buyer of German machines and other goods, but not to pre-war standards, and moreover, the unfavorable terms and long credits handicap business severely. In China, trade is stopped by the civil wars. The long coal strike in Australia has also had severe effects and makes itself felt even in Germany. Important American industries, such as the copper, cotton, and automobile, are influenced by the decreasing buying power of Germany, and this has the same reaction with regard to the importation of German goods to America. The reciprocal effect in international relations is becoming stronger with increasing industrialization, and unfavorable economic conditions in one country consequently have their reaction on all the others. The problem is how to create work for the unemployed. All other questions are of minor importance.

* * *

A.M.A. Production Group Plans Conference

"How can we have modern management without increased unit cost of overhead," will be the subject of discussion at the Production Division Conference of the American Management Association at the Hotel Statler, Cleveland, on June 9 and 10. Topics tentatively selected for papers are: Burden Trends in Modern Management; How Has Burden Been Reduced?; Controlling costs of Planning, Job Standardization; Controlling Cost of Research; and a number of similar topics.

Board of A.E.C. Appointed for 1930

The engineering profession of the United States is becoming more conscious of public responsibilities, and upon it the nation may rely for leadership in solving the social and economic problems of modern society, Carl E. Grunsky of San Francisco, president of the American Engineering Council, declares.

Mr. Grunsky's statement accompanied an announcement of appointments to the Administrative Board of the Council for 1930, and a call for a meeting of the Board to be held in Washington May 12 and 13 to adopt an active program of public and professional service.

The appointees represent national and local engineering societies.

The members of the new Administrative Board include, in addition to Mr. Grunsky, the following vice-presidents of the Council: L. P. Alford and L. B. Stillwell, New York; O. H. Koch, Dallas, Tex.; G. S. Williams, Ann Arbor, Michigan.

Among the representatives of the constituent organizations of the Council are: John Lyle Harrington, John H. Lawrence, Gen. R. C. Marshall, Jr., Charles Piez, E. N. Trump, D. Robert Yarnall.

* * *

Patch Named Head of Foundrymen's Association

Nathaniel K. B. Patch, secretary and works manager of the Lumen Bearing Co., Buffalo, was elected president of the American Foundrymen's Association in convention at Cleveland last week. The announcement of Mr. Patch's election and that of the other officers and directors whose nomination was recorded in *American Machinist* several months ago, was made at the opening business session of the convention. Mr. Patch succeeds Fred Erb as president.

Egbert Ballard, general foundry and pattern shop superintendent of the General Electric Co. plants at Lynn and Everett, Mass., was elected vice-president, and the following directors were elected to serve for three years: C. S. Anderson, vice-president and general manager, Belle City Malleable Iron Co., Racine, Wis.; H. R. Culling, vice-president of the Carondolet Foundry Co., St. Louis; Fred Erb, president, Erb-Joyce Foundry Co., Detroit; R. M. Maull, treasurer and sales manager, Tabor Manufacturing Co., Philadelphia; and D. M. Scott, vice-president in charge of manufacturing of the Gould Coupler Co., Depew, N. Y., and the Symington Co., Rochester, N. Y. The new officers will assume office at the annual meeting of the Board of Directors which will be held some time within the next three months.

The program following registration on May 12 included committee meetings, the official opening of the exhibition, the opening business session and a gray iron shop operation course on that day. The reception and dance, sponsored by the Cleveland Foundrymen's Committee, was held that evening. The entire program of the meeting was announced in the *American Machinist* of April 24, on page 714B.

* * *

Many Topics In N.A.P.A. Program

A large variety of topics are included in the general program just released for the 15th Annual Convention and "Informashow" of the National Association of Purchasing Agents, to be held from June 16-19 in the Stevens Hotel, Chicago. Among the topics are the "General Business Outlook"; "Price Fixing"; "Alloy Steel"; "Standardization of Paper"; "Follow-Up Systems"; a number of commodity sessions; "Research"; "Advantages and Dangers of Mergers"; "Inspection and Testing" and "Achievements of the Association."

* * *

S.A.E. to Receive Standards Report

Reports that have been prepared for submission to the Standards Committee and to the S.A.E. itself by divisions of the Standards Committee since the annual meeting in January, will be presented at the Standards Committee meeting on May 25 as a part of the summer meeting at French Lick Springs.

Among the subjects which will come up for discussion are ball hexagon bolts and nuts; aircraft pulleys of the plain bearing type; non-metallic anti-friction pulleys; streamline tie-rods; plain pulley spacers; internal tie-rods; shaft end; annular ball bearings; propeller-hub cones and nuts; separable type ball bearings; aluminum alloy specifications; round and slotted head bolts of the automobile type, and a number of other proposed standards.

* * *

Ex-Cell-O Aircraft Enlarges Plant

A new building equipped with travelling crane, the latest addition to the plant of the Ex-Cell-O Aircraft & Tool Corporation, Detroit, has been occupied by the Wayne Tool and Krueger divisions of Ex-Cell-O. The Wayne Tool Co., H. R. Krueger Co., and the Wolverine Screw Co., composing the Airparts & Tool Corporation, were acquired by Ex-Cell-O on March 11. Wayne Tool is engaged exclusively in the design and manufacture of special dies, tools and fixtures. The Krueger company is exclusively engaged in the design and manufacture of multiple tool operations. The Wolverine Division makes automatic screw machine products and will continue to occupy its present plant. The Continental Tool Works, Detroit, was acquired by Ex-Cell-O on May 1.

BUSINESS · BAROMETER

Shrewd judges think that the business pickup may come before it is generally expected

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

AS DO people, business advances sometimes by push and sometimes by pull. When it is helped by pull it usually gets out of a depression more rapidly than when it has to depend entirely on push. If only one of the major industries can be kept going by psychological or credit stimulation it will pull its sister industries up with it as the effects of its purchases of materials and labor are felt over an ever-widening area.

The foregoing explains why there is so much interest in the efforts to make of building a Moses to lead business out of the wilderness, and to make it more active while other industries are less active. Although the fact is not fully realized, except by the statistical-minded, the great expansion of construction to make up the war deficit, that began as soon as the depression of 1921-22 released the necessary funds, was the most powerful force in pulling business out of the despond of those years.

This year there is no war deficit to make up. In housing accommodation the country is commonly supposed to be overbuilt. But for almost a year and a half new construction of apartments and houses has been subnormal, and some shrewd judges think the pickup may come before it is generally expected.

In the kind of construction in which programs are more flexible, as utilities, roads, and public works, the expansion that was promised President Hoover's conference is taking place. Thus, road construction contracts awarded in 35 states during the first quarter are reported to have been 124 per cent larger than a year ago, and state and municipal borrowing during the same period was also above normal.

But it must be admitted that while building prospects are relatively more cheerful than those of other industries they do not promise a very powerful helping hand to business in general. Neither does the automobile industry, upon which some analysts confer the credit for most of our post-war prosperity. Without a great enlargement of building and automobile requirements steel cannot lead the way out of the depression. The day of railroad expansion has long since passed, and the time when aviation will be a major activity has not yet arrived. The electrical and chemical industries are not large enough to dominate others, and there is no hope of extraordinary growth in the older industries such as textiles and foods which already can supply wants that are limited by the human appetite.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

EXTREME SENSITIVITY is the characteristic of markets throughout the country, according to correspondents. Business of sizeable proportions one week followed by a decided slump the next, is a regular experience, for which no reason, except general business conditions, can be given. The general level of sales, however, has shown little, if any, rise during the past month or two, despite bettered conditions among prospective customers for tools. Inquiries are also spotty. The used-tool market is quiet in some sections, good in others.

CINCINNATI manufacturers report a slight improvement, dealers noticing little change. Detroit sales have again declined in spite of bettered conditions in the automotive industry. Milwaukee is optimistic, although present sales volume is rather small. The New England market is continuing quiet, although prospects are a little better.

PHILADELPHIA dealers are also finding little to compensate for their efforts, although improvement is expected soon. Chicago expects May to be lower than April in sales totals, judging by business to date, with the upturn placed in the fall. New York orders are few and far between, and inquiries are also a little slower. The second-hand market there is good. Cleveland business is unchanged.

This survey compels the conclusion that business will not be pulled up to higher activity, but that in all its branches it must push up together, and those who expected last fall that the complicated readjustments necessary would be completed overnight have now realized their mistake. The surplus supplies of raw materials that were disclosed by the decline in industrial activity all over the world must be absorbed and further production of them discouraged by the price declines which have taken place, and the process will be prolonged by the loss of purchasing power caused by those price declines and the industrial recession.

It is inevitable that our export trade this year will be the smallest in a good many years, and the continuing decline in the volume of acceptances outstanding as well as depressed shipping conditions show how widely extended is the falling off in trade.

As the foregoing is meant to be merely realistic, not pessimistic, it should be emphasized that the re-adjustments have now been under way for about eight months, and that in many cases their worst effects have already been felt, while the forces that will bring improvement, including easy money, have already been released. The recession is behind, not ahead. But it is not surprising that business continues slightly subnormal and that upon the showing of corporation reports to date there is less enthusiasm for the purchase of their shares at prices which discount much anticipated improvement.

Car loadings and the gross earnings of the railroads are both running about 10 per cent under the corresponding figures last year, and perhaps this figure fairly represents the decline in distributive trade. But that is not to say that business is "subnormal" to that extent, for the comparison is with a total that represents super-activity.

The automobile industry has gradually expanded its production throughout the year, but its sales apparently do not justify much further increase, and the laurels to date belong mostly to the two largest producers of low-priced cars. Tire production is increasing, and is likely to gain more. The steel mills are reducing their operations, and the weakness in prices, which in some cases are the lowest in fifteen years, foretells quietness in the immediate future.

But the sharp reversal that can occur when confidence that prices are at bottom is created was dramatically illustrated last week in the case of copper. When producers announced successive advances to 13 cents they sold more copper in six days than ever before in so short a time in the industry's history, and it is estimated that the increase in stocks which occurred during April will be more than wiped out in May.

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THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CINCINNATI

Business in the machine-tool industry of the Cincinnati district showed a slight improvement during the past week. Reports of manufacturers vary, there being a few decreases, but these were more than offset by increases of others, and the cumulative sales were at least a little larger than those of the previous week.

The sustaining feature of the past week's market was the sale of single tools and replacements to general machinists and miscellaneous users. The orders were well diversified, and the business was well scattered over the country. A fair number of inquiries were received, the major portion from general machinists and miscellaneous users, whose requirements were largely confined to single tools.

Selling agents report a fair demand in local and adjacent territory. A feature of their business is the replacing of obsolete tools.

DETROIT

Sales of machinery and of machine tools, which have been spotty and uncertain for many weeks, have lately decreased still further and now show little sign of returning to normal. A note of pessimism, which has been noticeable for some time, has become pronounced within the last ten days or two weeks, and dealers are making no attempt to give accurate estimates of future possibilities.

Few sales of any kind are being made and these few are not particularly significant. Now and again a dealer receives an order for an item of replacement equipment, usually involving only a few thousand dollars, or a few hundred. Most of the dealers are working hard and are maintaining their full staffs of salesmen, but they are meeting with almost no response.

So depressed is the market that dealers, salesmen, observers, and industrial executives have taken an attitude of unusual pessimism. No programs are being outlined by automobile or accessory manufacturers and no one spends any money that is not absolutely necessary to keep plants going.

Employment is advancing slowly and sales of automobiles and parts are increasing.

MILWAUKEE

If a curve were plotted of the trend of the demand for metal-working equipment, it would reveal a series of rather sharp peaks and deep valleys. This is especially true of the past three or four weeks, and particularly so in comparison with business since the first of the year. The trade does not consider this a reversal of form, but looks upon it as a favorable sign, indicative of a shifting movement preparatory to a more settled condition, and one that will produce a better and growing volume of really profitable business.

Considering the general condition, industrial construction in this locality of the character which means a present and prospective demand for toolroom and production floor equipment is of a relatively high order. When the situation undergoes scrutiny later, it will doubtless be found that the Milwaukee district at present is one of the most active sources of business in new machine tools of any comparable district in the country.

As for several months past, replacements constitute the bulk of the sales of new equipment. The call for used tools is only moderately active, but it is sufficient to effect a prompt transfer of supplies, which are not heavy when compared with stocks existing at similar periods in past years.

NEW ENGLAND

The New England machine-tool market continues quiet. Officials of companies contemplating the purchase of machine tools are awaiting a more general activity. Orders are fairly steady at a low level, and consist chiefly of replacement items. In view of some improvement in the past two weeks, used equipment dealers are of the opinion that the situation in their field has turned for the better.

Prospects in most lines of industry are far better than the comparative volume of orders from week to week would indicate. The upturn in industrial construction, current and prospective, has been a prominent New England feature for the past few weeks. Included are metal-working plants contemplating machinery purchases.

It is apparent that many builders of machine tools have concluded the dullest April experienced for some years. A number of companies have found their large back logs a salvation, but the point has been reached where industrial schedules are becoming more and more dependent on current bookings. Executives are inclined to the belief this will be beneficial rather than detrimental to the industry.

PHILADELPHIA

Machinery and machine-tool business continued at a low level throughout the Philadelphia market during the last two weeks. Some single orders from textile mills and one or two from woolen goods manufacturers, together with some purchases of equipment from lumber and cement manufacturers, were the only favorable spots in the local situation.

Belief generally prevails throughout this market that radio, steel, and shipbuilding will soon begin to show signs of recovery from the depression which has been prevalent for so many months. This belief is based upon conditions in those industries, but how soon the recovery will come, spokesmen would not hazard a guess.

There is no indication of any early buying from the automotive trade, and the airplane industry is uncertain also. Railroad buying and prospects for resumption of orders from that line are still indefinite.

The number of inquiries have fallen off about ten per cent, as compared to what they were at this time last year, but those that have been received were from firms whose requests for quotations and time of delivery are usually followed by orders.

CHICAGO

Unless the business reported during the first half of May by manufacturers' representatives and dealers shows marked improvement in the next two weeks, it is expressed as a belief that the total for the month will fall short of that of April. The exceptions are so few as to be almost negligible. In no line of tool production has there been shown an upward tendency, instances even being furnished of a reduction of operating hours and the temporary laying off of hands employed in the plants. It is not thought this situation will continue for long, but no forecasts are hazarded regarding its length. As heretofore reported, railroad buying saves the present market condition from what might almost be considered an acute depression. Inquiries for equipment required in shops of Western roads continue to be received. Within the last week the Union Pacific has issued a substantial list asking for prices on about a dozen units. The Milwaukee has sent out inquiries additional to those already in the hands of the trade. Tractor manufacturers still are in the market, but are buying only such equipment as is needed to complete present requirements. General industrial demand continues on the same low level as has existed for the last few months. Business in used tools is slow.

NEW YORK

Orders for machinery and machine tools in the New York market are few and far between, in the opinion of the majority of dealers. Sales generally are reported to be on a par with those of last week, which were none too good. One or two dealers, however, report a normal month so far, with every indication that the month as a whole will be good. Inquiries are also comparatively slow, although this factor makes little difference since the principal difficulty is getting prospective buyers to do something with quotations after they get them.

The second-hand market, usually affected in sympathy with that for new tools, is getting better. One dealer, normally selling only new tools, is filling in the dull time by picking up and selling used tools for which he has inquiries. Many of the inquiries are for good-sized tools, and the aggregate of the business (all strictly cash) so far this month is worth while. Another dealer selling structural equipment has made several sales to an aircraft corporation and has also received several good export orders.

CLEVELAND

While a small number of machine-tool manufacturers report a slight increase in their volume of business in the past two weeks, the majority report that sales are about at the same level. Sales have been limited to single pieces over a well-scattered territory. Inquiries, however, are on the increase. The Republic Steel Company recently placed an order for five tools with a local dealer.

An indication of increased activity in automobile production is seen in the placing of large orders with local accessory manufacturers. Figures on building permits show that factory construction so far has made an increase of 25 per cent over the first four months of 1929.

Business Items

The Phoenix Manufacturing Co., Joliet, Ill., which maintains factories at Catasauqua, Pa., and Montreal, also, has acquired the 50-year old Graver Corporation of East Chicago, Ind., and according to Edward N. Gosselin, president of the Phoenix, the East Chicago and Joliet plants may later be consolidated. P. S. Graver of the Graver Corporation has become vice-president in charge of sales for the new Graver Tank & Manufacturing Co., and his brothers, H. S. and W. F. Graver, are vice-presidents. W. F. Miller will be general manager of the plant.

The C. J. Tagliabue Manufacturing Co., Brooklyn, N. Y., recently announced the acquisition of the American Tobacco Co. property on Park Ave., extending from Nostrand Ave. to Sanford St., Brooklyn, N. Y. The new building will be occupied about the first of July. It is a five-story, concrete, fire-proof, structure covering the entire block front. The plot measures 200 x 234 ft. and the building provides approximately 300,000 sq.ft. of working floor space.

The Caterpillar Tractor Co., Peoria, Ill., is constructing a $200,000 assembly plant, 405x395 ft., and expects to have the unit ready within a month. Space in the main building now utilized for assembly purposes will be used for production. Earlier in the year a new $2,000,000 foundry was opened.

Ryan, Scully & Co., 3711 Wissahickon Ave., Philadelphia, Pa., has completed plans for a new office and manufacturing building at Westmoreland & Stokley streets, Philadelphia. The new building, estimated to cost $100,000, will more than triple the present facilities and will have direct connection with the Pennsylvania Railroad.

The Whittlesey Manufacturing Co., Bridgeport, Conn., has purchased stock and assets of the Taft Airplane Corporation, Elizabeth City, North Carolina.

The Federal Brass & Manufacturing Co., Marysville, Ohio, completely destroyed by fire on the afternoon of May 5, has not yet decided where it will rebuild or relocate.

The Hub Body Corporation, Boston, has been formed to take over the plant and equipment of the Hume Body Corporation, 112 Cumington St., Boston.

The Continental File Co., Anderson, Ind., has purchased the factory buildings and ground formerly occupied by the Laurel Motor Co., and will move its plant to the larger quarters.

Willard Equipment, Ltd., 860 Beach Ave., Vancouver, B. C., has been appointed distributor in British Columbia and Alberta for the Bucyrus-Erie Co., South Milwaukee, Wisconsin.

E. H. Bollenbacher, 725 Forsyth Bldg., Atlanta, Ga., has been appointed sales representative in the Atlanta district for the Pennsylvania Pump & Compressor Co., Easton, Pennsylvania.

The Continental Casting Co., Middletown, Conn., has been incorporated with $100,000 capital to manufacture and sell machinery and tools.

The Foote Bros. Gear & Machine Co., 111 North Canal St., Chicago, has elected the following additional officers, as a result of a recent directors' meeting: C. C. Commons, vice-president and assistant secretary; F. A. Emmons, vice-president in charge of sales of the gear and reducer division; W. A. Barr, vice-president in charge of manufacturing; H. H. Bates, vice-president in charge of the road machinery division; W. O. Bates, Jr., assistant vice-president; W. J. Heineman, assistant vice-president; and C. G. Wennerstrom, chief engineer.

Personals

E. W. Beckman, who recently resigned as foundry superintendent of the Kewanee (Ill.) Boiler Corporation, has been appointed assistant general superintendent of the Walworth Manufacturing Co., Kewanee.

Arnold O. Braun was recently made vice-president in charge of sales of P. R. Mallory & Co. Inc., Indianapolis.

William F. Chubb, son of I. William Chubb, editor, *American Machinist*, European and Colonial Edition, has become a metallurgist with Henry Ford & Son, Ltd., Cork, Ireland.

Allen B. Coffman, formerly district sales manager for the Reliance Electric & Engineering Co., has become associated with the Swind Machinery Co. of Philadelphia.

John H. Coghlan has been appointed direct New England representative of the American Manganese Steel Co., Inc., Chicago Heights, Ill., for the sale of Amsco manganese steel castings.

Henry Connor of the Samuel Stamping & Enameling Co., Chattanooga, Tenn., has also become connected with the Ferro Co., and will probably represent that company in the South.

R. H. Findlay has been appointed assistant mechanical engineer of the Riverside Iron Works, Ltd., Calgary, Alta. Mr. Findlay joined the staff of the Dominion Bridge Co. Ltd., in 1911. A few years ago he was appointed assistant mechanical engineer at the company's Lachine plant, and has now been transferred to Calgary.

E. C. Fry, formerly general manager of the Harrisburg (Pa.) Pipe & Pipe Bending Co., with F. D. Andrews, formerly general superintendent, has formed the Andrews-Fry Sales Co., Lewis Tower Bldg., Philadelphia.

T. S. Hart, who has been associated with the Terry Steam Turbine Co., Hartford, Conn., since 1919, has been appointed general sales manager.

Frank O. Green, president of the Green Foundry & Furnace Works, has been elected to the board of the Valley National bank, Des Moines, Iowa.

F. J. Haynes, president of Durant Motors, Inc., New York, has been re-elected to the directorate of the Chamber of Commerce of the United States.

Russell D. Knight was recently placed in charge of the district sales office established at 2814 West Broad St., Philadelphia, by the Pittsburgh (Pa.) Tube Company.

Paul C. Lewis, formerly with the Alloy Steel Products Co., Boston, has become affiliated with the New York sales office of the Globe Steel Tubes Co., Milwaukee.

G. LaRue Masters, sales manager of The National Lock Washer Co., New York, has been elected vice-president in charge of sales. Mr. Masters has been with the company since 1919.

Charles D. McCall has joined the staff of Manning, Maxwell & Moore, Inc., and has been placed in charge of sales of Putnam machine tools in the Detroit territory with headquarters in the General Motors Bldg. Mr. McCall was formerly chief engineer of the Jefferson Division, Chrysler Corporation.

Paul M. McCusker, formerly of the Motor Apparatus sales department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been transferred to the Westinghouse Electric Elevator Co., in the capacity of salesman, with his office in the Grand Bldg., Pittsburgh, Pennsylvania.

Walter T. Fishleigh, engineer with the Ford Motor Co. from 1919 to 1930, the latter six years with the Ford Engineering Laboratories as executive engineer and for one year production manager of the Ford Airplane Division, has resigned to become a consulting engineer, with offices at 2265 Longfellow Ave., Detroit.

R. S. McLaughlin, Oshawa, Ont., president of General Motors of Canada, Ltd., has been elected a director of the Canadian Pacific Railway. Mr. McLaughlin, who is also a vice-president of the General Motors Corporation

of the United States, has had a long career in the automobile industry in Canada.

Ross H. McMaster, president of the Steel Co. of Canada, Ltd., has been elected a director of the Bank of Montreal, to fill the vacancy created by the death of his father, the late William McMaster.

C. L. Newby has been appointed manager of the Western division of the Hyatt Roller Bearing Co., Newark, N. J. Mr. Newby has been associated with the company since 1918, and was assistant manager of the Western division, with headquarters in Chicago.

Charles Pack, New York consulting engineer specializing in die-casting practice, has moved his headquarters to 60 East 42nd Street, New York City.

Dr. Leopold Pessel, of the Metals Coating Co. of America, S. Martin, Jr., of the General Electric Co., and Dr. A. Krebs of the General Welding & Equipment Co., will be the speakers at a meeting to be held at the plant of the General Welding & Equipment Co., at 70 Lansdowne St., Boston, on May 23. In co-operation with the Boston section of the American Welding Society, the latest developments in metal coating, atomic-hydrogen welding, and shape-cutting machines and fabrication will be shown in exhibits. The exhibits will be open from 10 a.m. on, the meeting beginning at 7 o'clock in the evening.

A. J. Philpott, western sales manager of the Denver-Gardner Co., has been transferred to headquarters at Quincy, Illinois.

Dr. Ludwig Prandtl, professor at the University of Gottingen, Germany, and world authority on aerodynamics, has been awarded the second Daniel Guggenheim gold medal for notable achievement in aeronautics, it is announced by Dr. Alfred D. Flinn, secretary and treasurer, Guggenheim Fund.

William K. Robertson has been elected to succeed his father, the late William Robertson, as president of William Robertson & Co., Chicago.

H. W. Ruth has been put in charge of the newly opened district sales office in New York City of the Palmer-Bee Co., Detroit, Mich. The offices are located at 30 Church St., in Suite 308.

Raymond Seabrook, formerly secretary of the Nason Manufacturing Co., New York, was recently elected president to succeed his father, the late H. H. Seabrook.

M. E. Storey, president and general manager of the Storey Pump & Equipment Co. Ltd., Toronto, Ont., has formed a new company to be known as the Toronto Tractor & Equipment Co., Ltd. Mr. Storey will also be president of this company. The new company will be representatives of the Caterpillar Tractor Co.; Metalweld Inc.; and the Homelite Corporation.

Obituaries

James E. Sague, 67, nationally known mechanical engineer, who was at one time mechanical engineer of the West India Improvement Co., and at another time, engineer of tests and general foreman of machine shops of the Chicago, Burlington & Quincy Railroad at Jersey City, died in Poughkeepsie, N. Y., on May 9. Mr. Sague was a member of the A.S.M.E. and was mechanical engineer for the Schenectady Locomotive Works from 1892 to 1901, and later chief mechanical engineer and first vice-president of the American Locomotive Co., New York.

Charles F. Wayte, 61, chief mechanical engineer of the Skinner Engine Co., Erie, Pa., died recently at a hospital in Syracuse, N. Y., following a year's illness. He was also an attorney of prominence.

Charles E. Young, formerly director of the Ohio Brass Co., Mansfield, Ohio, but since 1915, vice-president of the Imperial Brass Manufacturing Co., Chicago, in charge of the Wattrous division, died recently at his home in Park Ridge, Illinois.

William H. Reeves, 77, chairman of the board of the Phoenix Iron Co., died April 26, at his home in Phoenixville, Pa. He was a member of the third generation of the Reeves family to be identified with the business.

Vincent G. Hazard, 76, engineer with the Pusey & Jones Corporation, Wilmington, Del., died recently. He had been affiliated with the company and its forerunner, Pusey, Jones & Betts, since 1877.

William F. Brown, 69, who until his retirement two years ago was president of the Brown Steel Co., Columbus, Ohio, died May 6 in Columbus after an illness of a year.

C. E. McDaniel, 73, president of the Ottumwa (Iowa) Boiler Works, which company he founded 40 years ago, died recently at his home in that city.

Carl Marquardt, 93, founder of the Milwaukee Woven Wire Works, now the Marquardt Co., and for 20 years its president, died on May 1. He retired about two years ago.

Forthcoming Meetings

Society of Automotive Engineers —1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

Associated Machine Tool Dealers —Meeting at Granville Inn, Granville, Ohio, June 4 to 5. A. G. Bryant, 2558 West 16th St., Chicago, is secretary.

National Association of Foremen —Convention at Toledo, Ohio, June 6-7. Harry J. Baumker, 316 Tenth St., Toledo, is convention secretary.

American Society of Mechanical Engineers — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 9 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

National Association of Purchasing Agents—Fifteenth annual convention, Stevens Hotel, Chicago, June 16-19. "Inform-A-Show" in conjunction. G. A. Renard, 11 Park Place, New York City, is secretary-treasurer.

Steel Industry's Executives—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

World Power Conference—Second annual conference, Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Bldg., Washington, is U. S. chairman.

American Society for Testing Materials—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

Steel Founders' Society of America—Semi-annual convention, Greenbrier Hotel, White Sulphur Springs, Va., June 26-27. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

International Congress for General Mechanics — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

National Metal Congress—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

American Welding Society—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

American Society of Mechanical Engineers—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

American Institute of Mining & Metallurgical Engineers — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

American Institute of Mining & Metallurgical Engineers — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

American Society for Steel Treating—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eischman, 7016 Euclid Ave., Cleveland.

Rise and Fall of the Market

WITH pig-iron prices sagging in Eastern markets, the steel business appears to be slowing down in all of its branches except pipe. The minimum on black sheets is off 10c., to $2.55 per 100 lb., base, Pittsburgh. In non-ferrous metals, prices are down this week in tin, antimony, solder, babbitt and scrap. Copper prices, on the other hand, continue to strengthen and there is firmness displayed also in quotations on lead at East St. Louis. Listed quotations on fabricated brass and copper are merely nominal, owing to the frequency with which copper prices have changed (upward) of late.

(*All prices as of May* 16, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35†	3.25	3.50@3.60†
No. 12	2.05@2.15	3.45†	3.30	3.55@3.65†
No. 14	2.15@2.25	3.55†	3.40	3.60@3.70†
No. 16	2.25@2.35	3.65†	3.50	3.70@3.80†
Black				
Nos. 18 to 20	2.35@2.45	3.85†	3.55	3.45@3.70
No. 22	2.50@2.60	4.00†	3.70	3.60@3.85
No. 24	2.55@2.65	4.05†	3.75	3.65@3.90
No. 26	2.65@2.75	4.15†	3.85	3.75@4.00
No. 28	2.80@2.90	4.75†	4.00	3.90@4.15
Galvanized				
No. 10	2.60	3.90†	3.80	3.55@3.80
Nos. 12 to 14	2.70	4.00†	3.90	3.65@3.90
No. 16	2.80	4.10†	4.00	3.75@4.00
No. 18	2.95	4.25†	4.15	3.90@4.15
No. 20	3.10	4.40†	4.30	4.05@4.30
No. 22	3.15	4.45†	4.35	4.10@4.35
No. 24	3.30	4.60†	4.50	4.25@4.50
No. 26	3.55	4.85†	4.75	4.50@4.75
No. 28	3.80	5.10†	5.00	4.75@5.00

*Light Plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	56.02%	43.48%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52. 6%	40.06%	53.3%	40.3%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	Thickness—B.w.g. and Fractions	Outside Diameter in Inches—¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick by ¾-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.25
Tin, Straits, pigs, New York			35.00@36.00
Lead, pigs, E. St. Louis	5.45	New York	6.50@ 7.00
Zinc, slabs, E. St. Louis	4.65	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.25@10.75	10.50	11.50
Copper sheets, base	23.25	23.25	23.75
Copper wire, base	15.87½	16.12½	15.87½
Copper, drawn, round, base	21.75	22.75	22.25
Copper tubing, base	25.00	26.50	26.00
Brass sheets, high, base	22.75	21.00	20.50
Brass tubing, high, base	24.75	25.00	25.50
Brass rods, high, base	18.00	19.25	18.75
Brass wire, high, base	20.25	21.50	21.00

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.25@11.00	11.75	10.11
Solder (½ and ½).....	25.75	25.50	26@28
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade.....			51.00
Commercial genuine, intermediate grade.....			37.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.00

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	9.50@10.00	13.50	9.25@ 9.75
Copper, heavy, and wire..	9.00@ 9.25	13.00	8.50@ 9.00
Copper, light, and bottoms	7.50@ 7.75	12.00	7.50@ 8.00
Heavy lead.....	4.00@ 4.12½	5.25	3.50@ 4.00
Tea lead.....	2.00@ 2.25	3.25	2.50@ 3.00
Brass, heavy, yellow....	5.00@ 5.25	8.00	5.00@ 5.50
Brass, heavy, red.....	7.00@ 7.50	12.50	7.50@ 8.00
Brass, light.....	4.00@ 4.25	7.00	4.50@ 5.00
No. 1 rod-brass turnings.	5.00@ 5.50	8.00	6.00@ 6.50
Zinc.....	2.00@ 2.25	3.00	1.75@ 2.00

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.....	$0.13	$0.16	$0.15
Cotton waste, colored, per lb....	.09½	.12	.12
Wiping cloths, washed, white, per lb.....	.13½	38.00 per M	.16
Sal soda, per lb.....	.01¾	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.148	.164	.15
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting..	per lb.	.034	.034	.035
Brass rods.....	per lb.	.18	.2125	.2125
Solder (½ and ½).....	per lb.	.2575	.28	.325
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.75	.75	.55
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.60
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	14.25
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws::	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Ont., East Windsor—Canadian Bridge Co., Walker Rd., J. W. Seens, Mgr., Walkerville — machinery and equipment for the fabrication of steel towers for proposed 1 story, 240 x 310 ft. factory on Sandwich St., here. Estimated cost $100,000.

Ont., Galt—Galt Malleable Iron Co., H. J. Bassett, Mgr.—complete machinery and equipment for pattern and carpenter shops to replace fire loss. Loss $30,000.

Opportunities for Future Business

Ala., Birmingham—Whiting Corp., Harvey, Ill., purchased plant of the Goslin-Birmingham Mfg. Co. and plans extensions and improvements for the manufacture of cranes, foundry equipment, heavy chemical machinery and other products. Estimated cost $1,000,000.

Calif., Pittsburg — Pittsburg Junior High School Dist., received lowest bid for the construction of a junior high school, including shops, etc., from W. Snelgrove, Richmond. $128,717. Noted May 1.

Calif., South Gate — Grand Rapids Store Equipment Co., 1545 Madison St. S. E., Grand Rapids, Mich., plans the construction of a factory, here. Estimated cost $250,000.

D. C., Washington — D. C. Commissioners, will receive bids until June 10 for the construction of a garage, offices and auto repair shops.

Ill., Chicago—American Can Co., 230 Park Ave., New York, N. Y., is receiving bids for a 5 story addition to plant at 60th St. and Western Ave. here, also plans a 2 story plant at Water and Chestnut Sts., Terre Haute, Ind. Estimated cost $3,000,000 and $1,500,000 respectively. Work will be done by separate contracts.

Ill., Harrisburg—C. V. Parker Co., is having plans prepared for the construction of a service station. Estimated cost $42,000. H. E. Boyle, Evansville, Ind., Archt.

Ind., Beech Grove — Cleveland, Cincinnati, Chicago & St. Louis Ry. Co., 230 East 9th St., Cincinnati, O., awarded contract for the construction of a 1 story, 184 x 444 ft. railroad shop building here. Estimated cost $200,000. Private plans. Noted Apr. 24.

Ind., Michigan City—Chicago, South Shore & South Bend R.R., awarded contract for the construction of a 100 x 200 ft. machine shop. Estimated cost $70,000.

Ia., Muscatine—Thompson Motor Corp., S. Block, V. Pres. and Gen. Mgr., plans the construction of a new plant on Stewart Rd.

Md., Baltimore—Danko Pattern & Mfg. Co., 31-37 Lee St., manufacturers of metal and wood patterns and models, plans a 1 story, 50 x 103 ft. factory at 2915 Keyworth Ave.

Mass., Boston—Shopper's Garage, c/o Jordan Marsh Co., Washington St., awarded contract for alterations to 6 story garage on Beach St. Estimated cost to exceed $40,000. Noted May 8.

Mass., Brockton—F. W. Murdock, 56 West Elm St., is receiving bids for the construction of a 1 story, 65 x 170 ft. repair and service garage, at Belmont St. and Chester Ave. Estimated cost $50,000. W. F. Barlow, 232 Main St., Archt. Noted May 8.

Mass., Cambridge (Boston P. O.)—Firestone Tire & Rubber Co., 1286 Main St., Akron, O., awarded contract for a 1 story service station and garage at 13-59 Broadway here. Estimated cost $45,000.

Mass., Cambridge (Boston P. O.) — F. W. Webster Co., 340 Congress Sts., Boston, will receive bids until May 29 (extended date), for the construction of a 5 story factory and office at Wadsworth and Haywood Sts. Densmore, LeClear & Robbins, Park Sq. Bldg., Boston, Archts. Noted May 8.

Mass., Lowell—Eastern Massachusetts Street Railway Co., 38 Chauncy St., Boston, awarded contract for the construction of a bus terminal garage on Middlesex St., here. Estimated cost $45,000. Noted May 1.

Mass., Medford (br. Boston) — Somerville Iron Foundry Co., 83 Washington St., Somerville, had plans prepared for the construction of a 1 story, 55 x 150 ft. foundry on Mystic Ave., here. Estimated cost $50,000 to $60,000. Noted Mar. 6.

Mass., Springfield—Chapman Valve Mfg. Co., L. S. Haswell, Pine St., Indian Orchard, awarded contract for a steel foundry and valve shop here. Estimated cost $40,000. Noted May 15.

Mass., Watertown—C. R. Hodge, 68 Massachusetts Ave., awarded contract for a 1 story garage on North Beacon St. Estimated cost $45,000. Noted May 15.

Mass., Watertown (Boston P. O.)—Riverside Trust, C. H. Hodge, Mgr., 68 Main St., awarded contract for a 1 story service station and garage at North Beacon and Court Sts. Estimated cost $50,000. Noted May 1.

Mo., St. Louis—Truck Terminal Co., 1219 Spruce St., awarded contract for a 1 story, 100 x 128 ft. truck terminal building at 632-33 South Broadway.

N. J., Jersey City—Jersey City Ladder Co., Inc., 677 Montgomery St., will soon award contract for a 2 story, 40 x 140 ft. factory on Crawfoot Ave. Estimated cost $40,000. B. Singer, 921 Bergen Ave., Archt. Noted May 15.

N. J., Newark—M. A. Wolf, 845 Broad St., Archt., will receive bids until June 1 for a 2 story auto radiator shop and garage at 268-274 Central Ave., for J. Black, 246 Central Ave. Estimated cost $40,000. Noted May 15.

N. J., North Bergen—Township Commission, Municipal Bldg., will not construct 3 story, 90 x 110 ft. garage and signal station. $150,000. Project indefinitely in abeyance. Noted May 8.

N. J., Paterson—Antler Holding Co., Inc., M. Maletesta, 9 Lee Pl., awarded contract for a 1 story, 100 x 100 ft. garage at Clay and Straight Sts. Estimated cost $150,000.

N. J., Preakness—Bd. of Chosen Freeholders, Court House, Paterson, will receive bids about June 1 for the construction of a 1 and 2 story, county airport, including machine and repair shops, hangars, etc. Estimated cost $200,000. Austin Co., 120 Broadway, New York, Archt. Garwood Ferguson, Court House, Paterson, County Engr.

N. Y., Brooklyn—Albany-St. Johns Corp., J. Solomon, Pres., 1350 Broadway, New York, is having sketches made for a 100 x 151 ft. garage at Albany and St. Johns Pl. Estimated cost $100,000. S. Pelton, 110 West 42nd St., New York, Archt.

N. Y., Brooklyn—Brooklyn Brass Works, L. Meier, Pres., Scholes and Waterbury Sts., is having sketches made for a 2 story, 24 x 100 ft. foundry. Estimated cost $40,000. Lee & Hewitt, 53 Park Pl., New York, Archts.

N. Y., Brooklyn — Dept. of Parks, awarded contract for a garage at Prospect Park. $24,000.

N. Y., Brooklyn—M. Greenberg, 8302 13th Ave., is having sketches made for a 2 story, 100 x 107 ft. service garage at 89th St. and 5th Ave. Estimated cost to exceed $40,000. Bly & Hamann, 551 Nostrand Ave., Archts.

N. Y., Brooklyn—J. F. McKenna, 58 Van Dyke St., plans the construction of a 150 x 200 ft. service garage at Columbia and Creamer Sts. Estimated cost $60,000. H. F. McLaughlin, 153 West 97th St., New York, Archt.

N. Y., Brooklyn—Robins Dry Dock Co., 25 Broadway, New York, plans alterations to machine shop at Beard and Dwight Sts. Estimated cost $60,000. Tilt Hargan Co., 90 West Broadway, New York, Archt.

N. Y., Long Island City—Charbin Realty Co., 163-18 Jamaica Ave., Jamaica, will receive bids about Sept. 1 for the construction of a service garage at 44th St. and 25th Ave. Estimated cost $70,000. M. Klein, 65 Court St., Brooklyn, Archt. Noted May 8.

N. Y., Long Island City—Mymand Construction Co., 6730 75th St., Middle Village, is having sketches made for a 100 x 100 ft. service garage at 39th St. and Nelson Ave. Estimated cost $40,000. M. Perlstein, 6735 75th St., Middle Village, Archt.

N. Y., New York—J. Boris, c/o C. Goodman, 375 Fulton St., Brooklyn, Archt., is having sketches made for a 2 story, 125 x 171 ft. service garage at 729 West 186th St. Estimated cost $150,000.

N. Y., New York — Consolidated Gas Co. of New York, c/o C. F. Hunter, 4 Irving Pl., will receive bids end of June for a 3 story, 99 x 100 ft. repair shop at 71st and Exterior Sts. Estimated cost $350,000. Noted May 8.

N. Y., New York—Corp., c/o E. F. Fischback, 226 East 41st St., awarded contract for a 100 x 125 ft. garage at 406 East 91st St. Estimated cost $150,000. H. Ginsberg, 206 East 42nd St., Archt. Noted May 8.

N. Y., New York—Kenport Construction Co., H. G. Sylvester, Pres., 1816 East 17th St., Brooklyn, is having sketches made for the construction of a 2 story garage, service station, etc., at Morris Park and Paulding Ave. Estimated cost to exceed $50,000. L. Pisciotta, 1912 Arthur Ave., Archt.

N. Y., New York — Kidansky & Levy, 424 Madison Ave., is having sketches made for a 6 story, 75 x 100 ft. garage at 216 West 56th St. Estimated cost $175,000. J. J. Glasler, 1440 Broadway, Archt.

N. Y., New York — Seven Hundred Forty Greenwich St. Corp., M. Wallenstein, Pres., 33 West 42nd St., awarded contract for the construction of a 4 story, 82 x 92 ft. service garage at 738 Greenwich St. Estimated cost $100,000. G. G. Miller, 545 5th Ave., Archt. Noted May 8.

N. Y., New York—J. Slattery, 26 Courtland St., is having plans prepared for a 2 story, 100 x 125 ft. addition to garage at 252 West 87th St. Estimated cost $100,000. H. J. Nurick, 44 Court St., Brooklyn, Archt.

N. Y., New York—Two Hundred Forty-Five West 25th St. Realty Corp., S. Silk, Pres., 50 Clark St., Brooklyn, is having sketches made for a 6 story, 63 x 98 ft. service garage at 241 West 26th St. Estimtaed cost $300,000. Slee & Bryson, 16 Court St., Brooklyn, Archts.

N. Y., Richmond Hill—Metz Auto Sales & Laundry Co., 127-15 Metropolitan Ave., will receive bids about Oct. 1 for a 76 x 112 ft. garage at Metropolitan Ave. and 129th St. Estimated cost $50,000. W. Holliday, c/o owner, Archt. Noted May 8.

N. D., Minot—State Highway Commission, H. C. Frahm, Ch. Engr. and Secy., will receive bids until June 5 for a 1 story, 40 x 40 ft. addition to shop and equipment building.

O., Cleveland—The Atlas Steel & Supply Co., M. B. Abrams, Pres. and Treas., 4401 Trumbull Ave., awarded contract for a 1 story, 97 x 150 ft. machine shop. Estimated cost $75,000.

O., Dayton — Constructing Quartermaster, War Dept., Wright Field, will receive bids until June 16 for a 1 story factory and storage building. Estimated cost $30,000.

O., East Palestine—Adamson Mfg. Co., manufacturers of steel tanks for gasoline storage, plans to rebuild 1 story, 50 x 200 ft. factory on East Clark St., recently destroyed by fire. Estimated cost $40,000. Private plans.

Pa., Carnegie—Braziell & Anderson, 309 4th Ave., Pittsburgh, is receiving bids for a 1 story, 65 x 100 ft. garage at Chestnut and James Sts., for J. C. Portman, Berger Bldg., Pittsburgh.

Pa., Monaca—St. Joseph Lead Co., 250 Park Ave., New York, N. Y., awarded contract for the construction of a smelter to produce both zinc metal and zinc oxide using the new electric-thermic process of treating the ore here. Estimated cost $3,000,000.

Pa., Palmer — Easton Airport Corp., M. Stead, Pres., Easton, is having preliminary plans prepared for the construction of an airport, including hangars, machine shops, etc., here. Estimated cost $150,000.

Wash., Pullman—Bd. of Regents, State College of Washington, will receive bids until May 31 for the construction of a shop building. S. A. Smith 301 Mechanic Arts Bldg., State College of Washington, Archt.

Wis., Milwaukee—The Heil Co., 26th and Montana Aves., awarded contract for a 2 story, 175 x 200 ft. factory. Noted May 8.

Ont., Galt—Galt Malleable Iron Co., plans the construction of a pattern shop. Estimated cost $30,000.

Ont., Sudbury—Bd. of Education, is having plans prepared for the construction of a 3 story high school. Estimated cost $400,000. P. J. O'Gorman, Mackie Black, Archt.